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ABSTRACT

This supplement contains the annual listing of research in mathematics education for 1994. Chapter 1, "Dissertation Research Reported in 1994" (Michael L. Bumbaugh & Sigrid Wagner), lists 251 dissertations abstracted in Dissertation Abstracts International during 1994 along with an index of dissertations by institution. Chapter 2, "Research Articles Published in 1994" (Gale A. Watson & Michelle K. Reed), lists 185 journal articles published in 1994 and includes a list of journals searched. Journal articles focusing on the interpretation and implications of research are included in this chapter. Chapter 3, "Research Papers and Monographs Produced in 1994" (Michelle K. Reed & Gale A. Watson), lists 57 papers and monographs abstracted for the ERIC database by the end of March 1995. Entries in each chapter contain annotations, major and minor category codes, and grade level codes. An index by major category codes is provided at the end. (MKR)

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JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION

RESEARCH ON MATHEMATICS EDUCATION REPORTED IN 1994

Supplement to the July 1995 JRME

Research on Mathematics Education

Reported in 1994

Supplement to the July 1995 JRME

edited by

Sigrid Wagner

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
and
ERIC CLEARINGHOUSE FOR SCIENCE, MATHEMATICS, AND ENVIRONMENTAL EDUCATION

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DEDICATION

This volume is dedicated to Marilyn N. Suydam, Professor Emerita at The Ohio State University, who for nearly 25 years compiled the annual listing of research that eventually became the July issue of JRME. Carefully hand searching journals and dissertation abstracts, and composing concise and informative annotations for every report of research on mathematics education, Dr. Suydam was solely responsible, year after year, for the single most popular feature ever to appear in JRME. With sincere appreciation for her longtime labor of love, as well as other numerous and outstanding contributions to the mathematics education profession she served so long and so well, we gratefully dedicate this volume to Marilyn Suydam.

PREFACE

This annual listing of research in mathematics education was prepared by the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/CSMEE), at the request of the JRME Editorial Board, and is the last such research listing to be included in a JRME subscription at the current subscription price. From this point forward, the July issue of JRME, which used to contain the research listing, will be of the same format as other issues of the journal.

As much as mathematics educators have valued the research listing in the past, with electronic databases becoming increasingly (but not uniformly) accessible, it is not clear in what format(s) future listings would be most useful. Though ERIC/CSMEE has the capacity to produce the listing, it is not even clear the extent to which a single annotated listing of mathematics education research is still valued by our profession. ***Thus, we earnestly solicit feedback from you, our reader, using either the enclosed postcard or the e-mail address given below.***

If response is favorable, ERIC/CSMEE anticipates producing the hard copy version of the listing for the next three years, to be included with a JRME subscription at minimal additional cost. At the same time, an electronic version will be available through the ERIC/CSMEE gopher and world wide web sites. At the end of three years, we will once again solicit feedback from JRME subscribers.

Because space limitations in this separate supplement are not as severe as in the July issue of the journal, some modest additions have been made to the listing. Annotations have been lengthened, ***MAJOR*** and ***MINOR*** codes have been added to each entry, and all entries have been indexed by ***MAJOR*** codes. Research papers and monographs dated 1994 and abstracted for the ERIC database by the end of March 1995, as well as journal articles focusing on the interpretation and implications of research, have been included. An index of dissertations by institution is also provided.

If the hard copy form of the listing is continued for the next three years, it is anticipated that future July supplements may include other features useful to JRME readers, such as the information that is currently compiled in the NCTM Research Advisory Committee's annual *Highlights* publication and Internet sources of mathematics education materials.

We hope you find this July supplement useful, and again, we sincerely solicit your comments and recommendations. You may contact ERIC/CSMEE via the enclosed postcard or by e-mail: erlcse@osu.edu. We welcome your suggestions.

KEY TO CODES

The following topic codes have been used to indicate the ***MAJOR*** and *MINOR* emphases of each dissertation, journal article, and paper in this listing. Each entry has been assigned a minimum of one and a maximum of three ***MAJOR*** codes and any number of *MINOR* codes. The combined topic index at the end of the volume reflects only ***MAJOR*** codes, with entries listed in 18 clusters of related topics.

The grade LEVEL of each study is indicated in parentheses at the end of the list of codes. Please note that studies related to preservice or inservice teacher education are so indicated by the appropriate topic codes (*PSRV*, *ISRV*). The LEVEL designated on teacher education studies refers to the grade level(s) at which the intern or teacher participants teach.

Topic Codes

A/S	Addition, subtraction	*GIFT*	Gifted
ACH	Achievement	*GRPG*	Grouping for instruction, cooperative learning
ADVM	Post-calculus mathematics	*IC*	Integrated curriculum
AFF	Affect	*IMPL*	Implications of research, interpretations of research
ALG	Algebra, pre-algebra	*INT*	Integers
ANX	Anxiety (student's)	*ISRV*	Inservice teacher education, professional development
ARTH	Arithmetic	*KNW*	Knowledge (student's)
ASSM	Assessment, evaluation	*LANG*	Language, psycholinguistics
ATT	Attitudes (student's)	*LD*	Learning disabled
BLF	Beliefs (student's)	*LRNG*	Learning, learning theories, cognitive development
CAI	Computer-assisted instruction	*LRNR*	Learners (characteristics of)
CALC	Calculators (general)	*LSAS*	Large-scale assessments, SAT, NAEP, SIMS, TIMSS, CSMS
CALS	Calculus	*M/D*	Multiplication, division
CC	Cross-cultural	*MANP*	Manipulatives
CII	Computer-integrated instruction	*MATL*	Materials (texts, other resources)
COMP	Computers (general)	*MEAS*	Measurement
CURR	Curriculum, programs	*MTCG*	Metacognition, reflection
D/R	Diagnosis, remediation	*NSNS*	Number sense
DEAF	Hearing impaired	*ORAL*	Oral communication, classroom discourse
DECM	Decimals	*PCT*	Percents
DEVM	Developmental mathematics, remedial mathematics	*PERS*	Personality
DSCM	Discrete mathematics	*PLAN*	Planning, decision making
EQV	Equivalence, proportions	*PLCV*	Place value, numeration
EST	Estimation	*PRF*	Proof, justification
ETHN	Ethnic, racial, cultural factors		
FRAC	Fractions, ratios		
GCAL	Graphing calculators		
GEND	Gender differences		
GEOM	Geometry		

Topic Codes (cont.)

Prob	Probability	*TAnx*	Anxiety (teacher's)
PS	Problem solving, reasoning	*TAtt*	Attitudes (teacher's)
Psrv	Preservice teacher education	*TBlf*	Beliefs (teacher's)
Rep	Representations, modelling	*Tchg*	Teaching (role, style, methods)
Revw	Reviews of research	*Tchr*	Teachers (characteristics of)
Rsch	Research issues, methods	*Tech*	Technology (general)
Soc	Social factors, parents, context	*TKnw*	Content knowledge (teacher's), pedagogical knowledge
Soft	Software, programming		
Stat	Statistics	*Vis*	Spatial visualization
Styl	Learning style, cognitive style	*Writ*	Writing, journals

Level Codes

EC	Early childhood, K-4	Se	Secondary, 5-12
MS	Middle grades, 5-8	K-12	All school levels
HS	High school, 9-12	Ps	Postsecondary, 13-
El	Elementary, K-3	All	All levels

DISSERTATION RESEARCH REPORTED IN 1994

MICHAEL L. BUMBAUGH, *Ohio State University*
SIGRID WAGNER, *Ohio State University*

This section lists 251 dissertations in mathematics education research that were abstracted in *Dissertation Abstracts International* during 1994. Each entry is coded (see Key to Codes) with 1-3 ***MAJOR*** and any number of ***MINOR*** topic codes, as well as the grade **LEVEL** (in parentheses). All entries are indexed by ***MAJOR*** codes at the end of this volume. Please note that studies related to preservice or in-service teacher education are so indicated by the appropriate topic codes (*PSRV, ISRV*). The **LEVEL** designated on teacher education studies refers to the grade level(s) at which the intern or teacher participants teach. An index of dissertations by institution is included at the end of this section.

Akins, Sondra Barber. (1994, February). Restructuring the mathematics and science curriculum: Elementary leadership teachers' perspectives (Columbia University Teachers College, 1993). *DAI, 54A*, 2859. [AAC 9400530]

Five case studies provide data on teachers' conceptual congruence with framework ideas, perceptions of curriculum development processes, behavior during restructuring, and targeted student outcomes. ***CURR, TCHR, TBLF*** **(EL)**

Allen, Olivia Kokko. (1994, February). The relationship of interdisciplinary teaching to achievement and motivation in precalculus and physics (Texas A&M University, 1993). *DAI, 54A*, 2930. [AAC 9403450]

Results showed the importance of interdisciplinary planning, classroom observations, student interviews, appropriate assessment instruments, and sensitivity to teaching styles in interdisciplinary teaching. ***IC, TCHG, ACH, CALS, PLAN*** **(HS)**

Almstrum, Vicki Lynn. (1994, December). Limitations in the understanding of mathematical logic by novice computer science students (The University of Texas at Austin, 1994). *DAI, 55A*, 1496. [AAC 9428445]

Novice computer science students experienced more difficulty with concepts involving mathematical logic than they did with other concepts in computer science. ***DSCM*** **(HS)**

Arnoldsen, Kari. (1994, August). Teaching methods and roles of tutorial instructors: A naturalistic inquiry (Brigham Young University, 1994). *DAI, 55A*, 210. [AAC 9418484]

Teaching roles assumed by (n=2) Brigham Young University math instructors reflected previous experience, and success in teaching was not related to role. Instructors used role-related questions (9 types identified) as an important teaching technique. ***ORAL, TCHG*** **(PS)**

Arriola, Leslie K. (1994, April). Teaching college adults remedial mathematics: Is there a best way? (University of Massachusetts, 1993). *DAI, 54A*, 3693. [AAC 9408249]

Interviews with (n=9) teachers and their students indicate that ability to do math does not change with age, ability to learn basic math depends mainly on motivation and having a good teacher, and good teachers stress active learning and higher order thinking skills. ***D/R, AFF*** **(PS)**

Artuso, Mariangela. (1994, June). Children's understanding of place value in mathematics: A cognitive developmental view (York University, 1993). *MAI, 32,* 1069. [AAC MM84191]

Dynamic assessment interviews with (n=20) children in each of grades 2, 4, and 6 suggested that instruction should link concrete understanding to semi-abstract and then to symbolic understanding, and that ability and cognitive style were major factors in performance.

***PLCV, REP, A/S, MANP, STYL* (EL)**

Awtry, Thomas Harold. (1994, September). Visual transformations in symbolic elementary algebra (The Louisiana State University and Agricultural and Mechanical College, 1993). *DAI, 55A,* 453. [AAC 9419864]

One group of algebra neophytes was taught visual and propositional rules using ordinary algebraic notation; another group, a syntactic tree notation. In ordinary notation, visual rules were significantly easier to recognize and somewhat more difficult to constrain. ***ALG, REP* (SE)**

Ayala, Celia C. (1994, February). Implications for effective implementation of mathematics and science for California schools (University of Southern California, 1993). *DAI, 54A,* 2859. [NOT AVAILABLE]

Teacher involvement in planning, the needs of language minority students, availability of bilingual teachers, and use of cooperative learning groups were critical in the successful implementation of a new science and mathematics program.

***IC, TCHG, ETHN, GRPG, LANG* (EL)**

Ayano, Tekle. (1994, September). Effects of training on teachers' acquisition of complex teaching strategies and student achievement: Evaluation of grade 10 mathematics teaching in Addis Ababa (University of Toronto, 1993). *DAI, 55A,* 454. [AAC NN86285]

Training Ethiopian teachers (n=22) in probing techniques produced more student responses per lesson than in control classes (n=12), but there were no significant differences in student (n=2674) achievement between the two groups. ***ISRV, TCHG, ACH, ORAL* (HS)**

Baker, Jayne Druann. (1994, March). Error correction: A comparison of two procedures on recall of multiplication facts by second-grade students (University of Oregon, 1993). *DAI, 54A,* 3305. [AAC 9405139]

Two error correction procedures significantly improved the short-term recall of multiplication facts for 10 second-grade students tutored by 10 gifted sixth-grade students, but no differential effects on achievement were found between the two procedures. ***D/R, M/D* (EC)**

Barker, John Lewis. (1994, September). Selected factors related to academic achievement of developmental introductory algebra students at the two-year college level (The University of Oklahoma, 1994). *DAI, 55A,* 476. [AAC 9421078]

Across (n=202) students, females had higher course averages than males; attendance, study groups, and math lab software improved performance; and successful teaching methods used calculators, manipulatives, and programmed instructional materials.

***DEVM, TCHG, ACH, GEND, SOC* (PS)**

Bartlett, Lucy E. (1994, June). The evaluation, improvement, and dissemination of a guided discovery method for teaching developmental mathematics (Nova University, 1993). *DAI, 54A,* 4381. [AAC 9411836]

Students (n=27) in a guided discovery approach to developmental mathematics had higher achievement, less anxiety, and were more confident in their mathematical ability than students (n=53) in traditional classes. ***DEVM, TCHG, ACH, ANX* (PS)**

Bassa, Marjorie Malissia. (1994, February). An exploration of differences in attitudes toward mathematics in the sixth-grade by gender, race, and achievement level (Memphis State University, 1993). *DAI, 54A*, 2860. [AAC 9402974]

Data from (n=124) sixth graders showed significant differences in attitude by gender, by achievement level, and for the race by achievement interaction. ***Att, Ach, Ethn, Gend* (MS)**

Bearden, Donna Katherine. (1994, August). Oral language proficiency as a predictor of mathematics achievement on the Woodcock-Johnson Psycho-educational Battery—Revised (Texas Woman's University, 1993). *DAI, 55A*, 234. [AAC 9417361]

Data on (n=1494) students in grades 3, 5, 8, and 11 suggest a surface understanding of language is insufficient for mathematics achievement; an understanding of relationships is needed. Females showed higher math aptitude in grades 3 and 5; males, higher achievement in grade 11. ***Ach, Lang, Assm, Gend, LD* (K-12)**

Behrend, Jean L. (1994, August). Mathematical problem-solving processes of primary-grade students identified as learning-disabled (The University of Wisconsin - Madison, 1994). *DAI, 55A*, 234. [AAC 9418323]

Five learning disabled students could solve a variety of word problems; major barriers were procedures learned without understanding. Students were capable of sharing their strategies, justifying their thinking, and helping each other understand. ***LD, PS, Arth, Oral* (EC)**

Bennett, Earl Marlin. (1994, July). Calculus students' concept images of functions in an environment of computer-generated animation of graphs of transformations of functions (University of Georgia, 1993). *DAI, 55A*, 58. [AAC 9416232]

Students' concept images of functions were dominated by an equation/numerical relationship. Animation exercises helped students think of functions as independent variables and graphs as dependent variables. ***Cals, Rep, Soft* (HS)**

Bennett, Jennie Marie Reed. (1994, May). The relationship of mathematics staff development training to the mathematics instruction of elementary and middle school teachers (University of Houston, 1993). *DAI, 54A*, 3935. [AAC 9411878]

Teachers (n=150) participating in the Texas Mathematics Staff Development Program were surveyed to determine the relationship between the number of training sessions attended and improvements in teaching, with grade level as covariate. ***Isrv, Tchg* (El)**

Bershinsky, Donna M. (1994, August). Predicting student outcomes in remedial math: A study of demographic, attitudinal, and achievement variables (University of Wyoming, 1993). *DAI, 55A*, 234. [AAC 9418665]

Good predictors of outcomes for traditional students in three remedial math courses were high school GPA, marital status, employment status, and financial aid status; good predictors for nontraditional students were feelings about school, self, and math.

***Ach, DevM, Aff, Soc* (Ps)**

Bethencourt Benitez, Jose Tomas. (1994, Spring). Cognitive strategies in arithmetic problem-solving [Estrategias cognitivas en la resolucion de problemas aritmeticos] (Universidad de la Laguna, 1985). *DAI, 55C*, 314. [NOT AVAILABLE]

Three coordinated studies investigated the effects of (1) wording of the problem, (2) students' verbal fluency, and (3) instructional techniques on the ability of (n=70;527;511) students in grades 3-8 to solve word problems and perform simple computations.

***Arth, PS, Lang, Tchg* (MS)**

Blagmon-Earl, Laverne. (1994, October). An assessment of knowledge for solving proportion-related problems (The Catholic University of America, 1994). *DAI, 55A*, 895. [AAC 9424296]

College algebra and precalculus students differed significantly in the number of knowledge nodes possessed related to proportions. Fewer algebra, but more precalculus students than expected possessed the equivalent-ratio and proportion knowledge nodes.

***EQV, LRNG, ALG, CALS* (PS)**

Bloome, Deborah Renee. (1994, June). The effect of task specific multiple-embedded metaphors on math task self-efficacy (University of Northern Colorado, 1994). *DAI, 54B*, 6441. [AAC 9413319]

This study examined the effect of task specific multiple-embedded metaphors on math task self-efficacy in (n=68) undergraduate students attending math classes. Interaction effects across gender and treatments were evaluated. ***AFF, LANG, GEND* (PS)**

Bolte, Linda A. (1994, October). Preservice teachers' content knowledge of functions: Status, organization, and envisioned application (University of Missouri - Columbia, 1993). *DAI, 55A*, 895. [AAC 9423944]

Preservice teachers (n=17) with extensive and integrated knowledge of functions and those with previous experience teaching mathematics were more successful transforming their content knowledge into appropriate forms. ***ALG, PRSV, TKNW* (SE)**

Bowman, Anita Hill. (1994, April). Preservice elementary teachers' performance on tasks involving building, interpreting, and using linear mathematical models based on scientific data as a function of data collection activities (The University of North Carolina at Greensboro, 1993). *DAI, 54A*, 3693. [AAC 9406687]

Preservice elementary teachers (n=52) who did not engage in data collection activities scored higher on the posttest and on all 36 individual test items than students who engaged in data collection. ***PRSV, REP, ALG* (EL)**

Brodney, Sandra Buntrock. (1994, February). The relationship between student achievement, student attitude, and student perception of teacher effectiveness and the use of journals as a learning tool in mathematics (The University of Southern Mississippi, 1993). *DAI, 54A*, 2884. [AAC 9402523]

Students (n=542) in grades 3, 4, and 5 who used journals daily (1) perceived that they had a greater opportunity to learn and that their teachers were more effective but (2) did not differ in achievement or attitude from the control group. ***WRIT, ACH, ATT, BLF* (EL)**

Bull, Michael Porter. (1994, January). Exploring the effects on mathematics achievement of eighth-grade students that are taught problem-solving through a four-step method that addresses the perceptual strengths of each student (University of South Carolina, 1993). *DAI, 54A*, 2497. [AAC 9400198]

Students (n=511) who were taught problem solving through "Magic Math" improved significantly more in mathematics than students taught through more traditional methods.

***PS, TCHG, ACH* (MS)**

Burkam, David Thomas. (1994, October). Prior calculus knowledge and self-selected tracking in college calculus (The University of Michigan, 1994). *DAI, 55A*, 895. [AAC 9423152]

Special sections of calculus for students who enter college without any previous exposure to calculus did not lead to improved performance and the "calculus gap" widened for those in the special sections. ***CALS, GRPG, CURR* (PS)**

Burks, Linda Carol. (1994, May). The use of writing as a means of teaching eighth-grade students to use executive processes and heuristic strategies to solve mathematics problems (The University of Michigan, 1993). *DAI, 54A*, 4019. [AAC 9409614]

Writing was an effective means of teaching students (n=371) to solve problems. Writing activities enabled students to verbalize their thought processes and helped them develop a systematic approach to problem solving. ***PS, WRIT* (MS)**

Burns, Luanne Marie. (1994, January). Meadow: An integrated system for intelligent tutoring of subtraction concepts and procedures (Columbia University, 1993). *DAI, 54A*, 2510. [AAC 9333735]

Students (n=76) did better with student-based feedback (directed at the student's errors) than with domain-based feedback (reteaching the correct procedure without regard for the student's specific mistakes). ***D/R, SOFT, A/S* (EC)**

Busta, Maureen E. (1994, September). The relationship between middle school students' knowledge of the concept of variable and the use of concrete manipulatives (University of Northern Iowa, 1993). *DAI, 55A*, 497. [AAC 9420286]

A program based on the use of concrete manipulatives helped students understand the concept of variable. Sixth and seventh graders in England scored higher than those in Iowa, but eighth graders performed similarly in both locales. ***ALG, MANP, ATT, CC* (MS)**

Caftori, Netiva. (1994, November). Examination and evaluation of computer software in relation to gender differentiation and educational effectiveness (University of Illinois at Chicago, 1994). *DAI, 55A*, 1246. [AAC 9426613]

Questionnaire responses of (n=60) students in grades K-3 showed only minor differences by gender. Middle school data showed that educational software is often not used as intended and should be integrated into the curriculum. ***GEND, SOFT, JH* (EL)**

Caniglia, Joanne Carmel. (1994, December). The transformation and enactment of teachers' content, pedagogical, and personal practical knowledge: Four case studies of expert secondary mathematics teachers (Kent State University, 1994). *DAI, 55A*, 1497. [AAC 9428886]

Enactment of teachers' knowledge should include strong representations and rich connections; integration of content, pedagogical, and practical knowledge; and openness to new resources. ***TKNW, TCHR, REP* (HS)**

Capps, Jesse Louis. (1994, October). The effects of pure E strategies and of pure C strategies, the number of moves and the student's relevant knowledge on learning a researcher designed algebraic concept (North Carolina State University, 1994). *DAI, 55A*, 896. [AAC 9425453]

Relevant knowledge, number of moves and type of teaching strategy (C or E) were significant factors in determining concept attainment scores of (n=289) Algebra II students. ***ALG, TCHG, ACH* (HS)**

Carter, Jamye Pearl Witherspoon. (1994, May). Personal factors influencing the decision of black students to participate in optional mathematics courses (Auburn University, 1993). *DAI, 54A*, 4020. [AAC 9411402]

Mother's encouragement, and father's and mother's help were found to be significant predictors of participation in nonrequired mathematics courses for (n=117) seventh graders. Hours of television was a predictor for (n=147) eleventh graders and beyond. ***ETHN, SOC* (K-12)**

Carter, Richard C. (1994, November). An arithmetic to algebra transition: Using metaphors to overcome arithmetic barriers to understanding mathematical problems involving letters (Massachusetts Institute of Technology, 1994). *DAI, 55A*, 1214. [NOT AVAILABLE]

Sixth grade students were introduced to the use of letters in mathematical problems using a bag of marbles to stand for an unknown value. Students in the experimental group improved significantly more than a control group, but did not understand letters as specific unknowns. ***ALG, ARTH, MANP*** **(MS)**

Caselman, Bruce Dale. (1994, January). Factors affecting success in college algebra (University of Arkansas, 1993). *DAI, 54A*, 2497. [AAC 9334038]

Four case studies suggest 14 factors affecting success in college algebra grouped into 5 categories: environment, motivation, climate, ability, and opportunity. ***AFF, SOC, ALG*** **(PS)**

Cerreto, Frank Anthony. (1994, June). A study of a group of students enrolled in a college-level algebra course emphasizing realistic mathematics (Rutgers the State University of New Jersey - New Brunswick, 1993). *DAI, 54A*, 4382. [AAC 9415247]

Three students utilized a variety of schemas to help them solve problems. Some representations were numerical, some were graphical, and some were algebraic in form. Situational knowledge appeared to amplify their ability to reason mathematically. ***ALG, PS, REP*** **(PS)**

Chakalisa, Paul Algebra. (1994, June). Relationships of student gender, teacher experience and setting to student's achievement and attitudes toward mathematics in Botswana community junior secondary schools (Ohio University, 1994). *DAI, 54A*, 4340. [AAC 9416021]

Students (n=800) in 40 junior secondary schools in Botswana showed significant differences in achievement based on setting, gender, and teacher experience; differences in confidence based on gender, attitudes toward success, math as a male domain, and teacher's attitude. ***ACH, GEND, TCHR, AFF*** **(SE)**

Chalardkid, Piaphai. (1994, September). Test development of mathematics subject matter knowledge levels of division of rational numbers for Thai preservice elementary teachers (Oregon State University, 1993). *DAI, 55A*, 535. [AAC 9422153]

A 42-item instrument was developed and administered to (n=272) preservice elementary teachers at eight teachers' colleges in eight provinces in northern Thailand. Item difficulty was used to select the 32 items in the final instrument. ***ASSM, FRAC, PRSV, TKNW*** **(EL)**

Chen, Tung-Shen. (1994, February). The use of selected mastery learning techniques on mathematics performance in nondisabled, learning disabled, and educable mentally retarded children (Drake University, 1992). *DAI, 54A*, 2862. [AAC 9332568]

Mastery learning strategies promoted learning outcomes in mathematics for nondisabled children, for learning disabled children, and to a lesser extent, for educable mentally retarded children. ***LD, TCHG*** **(EC)**

Chien, Shu-Jane. (1994, February). Cognitive addition: Strategy choice in young children with normal hearing and children with hearing impairment (The Ohio State University, 1993). *DAI, 54A*, 2930. [AAC 9401233]

Individual interviews with (n=64) students in grades K and 2 showed that cognitive processes for solving addition problems in children with hearing impairment are qualitatively similar to, but quantitatively different from, those in children with normal hearing. ***DEAF, LRNG, A/S*** **(EC)**

Cichos, Reginald Alexander. (1994, June). A case study of the mathematical behavior of a gifted learning disabled secondary student (Simon Fraser University, 1992). *MAI, 32*, 793. [AAC MM83752]

This study explores the thinking of a gifted learning disabled secondary student and concludes that the student is a highly self-motivated learner only in situations where the curriculum or learning activities match his special interests. ***GIFT, LD, AFF, LRNG*** **(SE)**

Clark, Faye Baker. (1994, January). Identification of multiplicative thinking in children in grades 1-5 (University of Alabama at Birmingham, 1993). *DAI, 54A*, 2497. [AAC 9333175]

Individual interviews with (n=336) students showed that multiplicative thinking appears early and develops slowly. Introduction of multiplication in second grade is appropriate but should not be taught only as repeated addition. ***LRNG, M/D*** **(EL)**

Clark, John Leonard. (1994, September). Teachers exploring the concept of mathematical inquiry (University of Toronto, 1993). *DAI, 55A*, 497. [AAC NN86370]

Three case studies document a remarkable transition from a transmission to constructivist approach to teaching. Difficulties were experienced in changing patterns of communication, new roles for teacher and students, and different approaches to planning.
ISRV, TCHG, ORAL, PLAN **(MS)**

Clarke, William Robert. (1994, July). The effects of computerized instruction on the improvement and transfer of math skills for low-skilled and below average-skilled sophomore students, considering student gender, ethnicity, and learning style preferences (University of La Verne, 1993). *DAI, 55A*, 21. [AAC 9416530]

Recommendations include: (1) trying different kinds of CAI, (2) considering students' learning style preferences, and (3) emphasizing applied mathematics. ***CAI, ACH, STYL*** **(HS)**

Clay, James Hamilton. (1994, February). The use of technology in the delivery of instruction in Algebra II in Texas public secondary schools (University of North Texas, 1993). *DAI, 54A*, 2862. [AAC 9401134]

A survey of (n=266) Algebra II teachers indicated lack of resources and effective software are major deterrents to computer use, graphing calculators are used much more than computers in instruction, and teachers with at least 10 years' experience are more likely to use computers.
TCHG, TECH, ALG **(HS)**

Costa, Sara Waite. (1994, October). Adolescents' understanding of percent problems (Clark University, 1994). *DAI, 55A*, 896. [AAC 9424696]

On a written test of 20 problems, seventh graders (n=20) solved fewer problems than Algebra II students (n=20). Interviews suggested four patterns of conceptual and procedural knowledge. ***LRNG, PCT, EQV*** **(SE)**

Covell, John Andrew. (1994, December). How deaf postsecondary youths solve mathematics word problems (Lamar University - Beaumont, 1994). *MAI, 32*, 1517. [AAC 1357319]

American Sign Language signed through the air or in print, as modes of presenting word problems, produced more correct answers among (n=23) deaf youths than English, either signed through the air or in print. ***DEAF, LANG, PS, WRIT*** **(PS)**

Cox, Gerry Lee. (1994, February). Identification of the at-risk mathematics student within the community-college environment (Andrews University, 1993). *DAI, 54A*, 2930. [AAC 9334296]

Remediated at-risk students (n=40) performed as well as nonremedial students (n=48) in a first college-level math class. Females outperformed males and older students outperformed younger students. ***ACH, D/R, GEND, LRNR*** **(PS)**

Dallaway, Richard Zak. (1994, Fall). Dynamics of arithmetic: A connectionist view of arithmetic skills (University of Sussex, 1994). *DAI, 55C*, 1017. [NOT AVAILABLE]

Two models are presented—one of memory for multiplication facts and one of children's errors in multicolumn multiplication—both of which are built from connectionist components and useful for modeling procedural skills in arithmetic. ***LRNG, M/D*** **(EC, PS)**

Dapples, Birdeena Crandall. (1994, October). Teacher-student interactions in SIMMS and non-SIMMS mathematics classrooms (Montana State University, 1994). *DAI, 55A*, 934. [AAC 9423043]

Four teachers trained in the the constructivist methodology of the Systemic Initiative for Montana Mathematics and Science showed more student-centered interactions in SIMMS classrooms, but the majority of classroom interactions were still teacher-centered.

***ISRV, TCHG, IC, ORAL* (HS)**

Dean, Ceri Burns. (1994, March). Teachers' conceptions of problem-solving: Three case studies (The University of Connecticut, 1993). *DAI, 54A*, 3358. [AAC 9405257]

Three teachers believed the main reason for teaching problem solving was to develop students' critical thinking skills, but the problems they presented were routine textbook problems designed to reinforce skills. ***PS, TBLF* (MS)**

Diaz Obando, Evangelina. (1994, June). Constructing a portrait of a high school mathematics teacher in Costa Rica (The Florida State University, 1993). *DAI, 54A*, 4342. [AAC 9413292]

Stated beliefs were that teachers provide students with opportunities to construct meaning for themselves while beliefs-in-practice suggested that direct instruction is an effective way to teach. Planning was more influenced by the syllabus than by student knowledge.

***TBLF, PLAN* (HS)**

Diaz Santana, Enoc. (1994, March). The impact of inservice training on teachers' confidence and students' mathematics achievement (Arizona State University, 1993). *DAI, 54A*, 3352. [AAC 9332970]

Data on (n=42) teachers showed that a year-long in-service program on teaching mathematics to LEP students had a positive effect on confidence, but at no stage did students in their classes outperform students in control classes. ***ACH, ISRV, TANX, LANG* (MS)**

Dinkheller, Ann Louise. (1994, May). Graphing calculators in precalculus: Gender, anxiety, and achievement (University of Cincinnati, 1993). *DAI, 54A*, 4020. [AAC 9407800]

There were no gender differences in either anxiety or achievement, but there was a reduction in anxiety from the beginning of the precalculus course to the end.

***CALS, GCAL, ACH, ANX, GEND* (PS)**

Dipillo, Mary Lou. (1994, October). A quantitative/qualitative analysis of student journal writing in middle-grade mathematics classes (The University of Akron, 1994). *DAI, 55A*, 896. [AAC 9425886]

Journal writing produced no significant differences in student (n=113) achievement, but may contribute to an increased understanding of mathematical concepts for students and to a better understanding of students' difficulties for teachers. ***WRIT* (MS)**

Dobbins, E. Renee. (1994, February). Math computer assisted instruction with remedial students and students with mild learning/behavior disabilities (The University of Alabama, 1993). *DAI, 54A*, 2980. [AAC 9403308]

This study compared the performance of third- and fourth-grade students with and without mild learning/behavior disabilities when using the computerized program "Math Concepts and Skills." Some significant differences in gains were found. ***CAI, LD, ACH, D/R* (EC)**

Dorgan, Karen. (1994, June). Teachers' orientations toward teaching, learning, and mathematics: Three teachers' decisions concerning the implementation of a revised elementary mathematics curriculum (University of Virginia, 1994). *DAI, 54A*, 4342. [AAC 9415594]

While enacting a revised curriculum intended to reflect the NCTM Standards, the teachers maintained fairly traditional teaching styles. Problem solving and application of technology appeared as "add-ons" to the usual instructional program. ***CURR, TCHG, PLAN, TBLF* (MS)**

Dresden, Janna. (1994, July). Gender, temperament, and mathematics achievement (University of Georgia, 1993). *DAI, 55A*, 63. [AAC 9416248]

An 11-year longitudinal study found few gender differences in achievement except on the SAT in eleventh grade, but temperament measured in first grade was strongly related to achievement throughout the study. ***GEND, PERS, ACH* (K-12)**

Drevno, Gregg E. (1994, February). Effects of error correction strategies on long division performance of students with learning problems (The Ohio State University, 1993). *DAI, 54A*, 2980. [AAC 9401245]

This study compared a Tell Plus Show and Tell Plus Write error correction strategy on the math performance of (n=5) high school students with learning problems. No functional effect in favor of either treatment was found. Students preferred Tell Plus Write.
***D/R, LD, M/D* (HS)**

Drury, John H. (1994, December). A survey to investigate teacher awareness of alternative assessment of students in mathematics (The Ohio State University, 1994). *DAI, 55A*, 1497. [AAC 9427700]

A survey of (n=126) public school teachers in primary (K-2), elementary (3-5), middle school (6-8), and high school (9-12) showed that significant differences in awareness of assessment practices exist among the four levels. ***ASSM, TKNW* (K-12)**

Duchrow, Linda Lee. (1994, November). Effect of HyperCard based electronic performance support system on teacher attitude towards mathematics (University of Northern Colorado, 1994). *DAI, 55A*, 1214. [AAC 9427444]

Three classes of prospective elementary teachers explored the four-color problem, probability, Hamiltonian circuits, series, and tessellations using HyperCard. All three classes significantly improved their perception of math, and one showed a decline in mathematics anxiety.
***SOFT, PRSV, TANX, TATT* (EL)**

Easley, Rebecca Elaine Davis. (1994, September). The development and evaluation of the Mathematics Assessment of Performance and Communication (MAPC) Test (The University of Oklahoma, 1994). *DAI, 55A*, 498. [AAC 9421080]

Performance of tenth-grade students on a test of mathematical problem solving and communication (three open-ended tasks with no clear method of solution) suggest limited student experience with open-ended questions. ***ASSM, PS, WRIT* (HS)**

Edwards, Thomas Grover. (1994, December). Looking for change in teaching practice in a mathematics curriculum innovation project: Three case studies (The Ohio State University, 1994). *DAI, 55A*, 1497. [AAC 9427703]

Innovative text materials both enabled and inhibited change in teachers' practices; changes that occurred were due to a reflective process; peer interaction and administrative support were important during implementation. ***CURR, ISRV, TBLF* (SE)**

Ellison, Marian Joan. (1994, May). The effect of computer and calculator graphics on students' ability to mentally construct calculus concepts. (Volumes I and II) (University of Minnesota, 1993). *DAI, 54A*, 4020. [AAC 9411246]

A technologically enhanced environment did positively affect students' (n=10) ability to construct an appropriate concept image of the derivative, distinguish between graphs of functions and derivatives, and perform symbolic differentiation.

***GCAL, SOFT, CII, CALS, LRNG* (Ps)**

Emenaker, Charles Edward. (1994, March). An evaluation of the influence of a problem-centered mathematics course on the beliefs preservice elementary school teachers hold about mathematics (Indiana University, 1993). *DAI, 54A*, 3359. [AAC 9404345]

Surveys (n=137) showed significant changes in beliefs about mathematics among students earning an A or B in the course. Interviews (n=9) revealed increased confidence in mathematical abilities and an increased likelihood of using innovative instructional approaches.

***CURR, PRSV, TBLF* (EL)**

Estes, Mareene P. (1994, July). Teachers' perceptions of principals' beliefs about mathematics (University of Georgia, 1993). *DAI, 55A*, 22. [AAC 9416251]

Principals' beliefs about mathematics and mathematics teaching and teachers' perceptions of those beliefs were not significantly different. Student mathematics achievement did not differ significantly according to the congruence of beliefs and perceptions. ***TBLF, ACH* (MS)**

Fan, Der-Hsin. (1994, September). A survey of classroom assessment in Taiwan (University of Pittsburgh, 1993). *DAI, 55A*, 539. [AAC 9421462]

Chinese language and mathematics teachers used periodic examinations to assess knowledge, comprehension, and application, with little attention to higher order thinking levels. They used oral questioning and performance assessments to measure higher level thinking skills.

***ASSM* (MS)**

Fan, Ning. (1994, April). The effect of problem text on solving difference-finding word problems (University of Calgary, 1993). *MAI, 32*, 411. [AAC MM83142]

First graders' solutions for EQUALIZE and WON'T GET problems were found to be significantly higher than for the COMPARE problems. The EQUALIZE problems were most frequently solved by using an ADD-ON strategy, and the WON'T GET problems by a MATCH strategy. ***LANG, PS, REP* (EC)**

Faurot, Vivienne Gerard. (1994, March). An exploration into the effects of mathematical knowledge, beliefs, and emotions on task performance by university calculus students (University of Oregon, 1993). *DAI, 54A*, 3359. [AAC 9405165]

Students (n=8) worked on two derivative tasks: traditional (algebraic reasoning) and nontraditional (graphical reasoning). Traditional task results showed several clear patterns. The initial interpretation of the nontraditional task had the greatest influence on performance.

***AFF, BLF, KNW, CALS* (Ps)**

Floyd, Teresa. (1994, January). A comparison of two instructional sequences for the teaching of estimation of fractional computation to fifth-grade students (University of Missouri - Columbia, 1992). *DAI, 54A*, 2498. [AAC 9400024]

Nine classes were assigned to pre-algorithmic or post-algorithmic treatments or to the control group. Both treatment groups estimated significantly better than the control group, but the difference was not significant six weeks later. ***EST, TCHG, FRAC* (MS)**

Follett, Scott C. (1994, July). Anticipation and abstraction in problem-solving in a Logo environment (The Florida State University, 1994). *DAI, 55A*, 58. [AAC 9416144]

Case studies of eighth-grade students indicated a direct relationship between degree of field-independence/dependence and success with problem solving for those students with extreme measures of cognitive style. ***SOFT, STYL, PS* (MS)**

Foutz, Paul Frederick. (1994, March). The effects of a mathematics laboratory course on achievement for beginning algebra students at a public community college (The University of Texas at Austin, 1993). *DAI, 54A*, 3359. [AAC 9400886]

An additional two hours per week in a math lab produced no significant differences in achievement. ***DevM, Tchg*** **(Ps)**

Frant, Janete Bolite. (1994, October). Educational computer technology in Brazil: The diffusion and implementation of an educational innovation (New York University, 1994). *DAI, 55A*, 938. [AAC 9422993]

This case study traces the history of the implementation process, describes educational computer technology usage in 1993, recounts the federal initiatives taken to implement computers in the public school system, and analyzes the diffusion process. ***Comp, Curr*** **(K-12)**

Fredenberg, Virgil Grant. (1994, July). Supplemental visual computer-assisted instruction and student achievement in freshman college calculus (Montana State University, 1993). *DAI, 55A*, 59. [AAC 9417924]

Weekly computer lab work in four sections of a traditional college calculus course produced little change in attitudes and anxiety, and no significant change in achievement. Lab students performed as well as students who received additional homework.

CAI, Cals, Ach, Anx, Att **(Ps)**

Fullerton, Olive Catherine. (1994, September). An investigation of the mathematical 'register' used in four elementary classrooms during geometry learning experiences (University of Toronto, 1993). *DAI, 55A*, 456. [AAC NN86315]

Observations of four classrooms revealed that teachers and students use mathematics register, or language, to drive, direct, and support their own activity as well as the activity of others; to query and respond to queries; and to provide information. ***Oral, Geom*** **(El)**

Gabriele, Anthony John. (1994, September). The influence of partner achievement status on children's collaborative solutions to mathematical word problems (University of Pittsburgh, 1993). *DAI, 55A*, 511. [AAC 9421464]

Data from (n=68) students in grades 4 and 5 suggest that working with a same-status partner may be more cognitively beneficial than working with a partner of higher status when access to more advanced problem understanding is guaranteed. ***Grpg, Soc, PS*** **(El)**

Gerhard, Nancy Elizabeth Holmgreen. (1994, February). Learning style time preferences among middle school mathematics students (The University of Texas at Austin, 1993). *DAI, 54A*, 2931. [AAC 9400890]

Middle school students preferred afternoon for learning in general, and mathematics in particular. However, there were no differences in achievement between students whose class schedules and preferred times for mathematics instruction were congruent versus dissonant.

Styl, Ethn, Gend **(MS)**

Gibbs, Linda Louise. (1994, December). Analysis of developmental mathematics programs in Texas community colleges which are successful with black and Hispanic students (The University of Texas at Austin, 1994). *DAI, 55A*, 1457. [AAC 9428521]

Eight colleges whose developmental math programs are successful with minority students place high value on basic skills and offer the program through the math department. Assessment and placement of students are crucial, and instruction is lecture-based with math lab support. ***DevM, Ethn, Assm, Tchg*** **(Ps)**

Gillespie, Bonnie V. (1994, May). The relationship of personality type to mathematics achievement in high school seniors (West Virginia University, 1993). *DAI, 54A*, 4020. [AAC 9410319]

Data on (n=269) twelfth-grade students showed that there is no MBTI type that correlates highly with mathematics achievement, but introverts had significantly higher math GPAs than extraverts. **ACH, PERS (HS)**

Gittinger, Dennis Joseph. (1994, December). Cooperative learning and computer-assisted instruction: A comparison of student achievement in arithmetic and algebra in the college developmental algebra class (The University of Texas at Austin, 1994). *DAI, 55A*, 1497. [AAC 9428525]

Results suggest that cooperative learning is a more powerful technique than computer-assisted instruction, especially for females and minorities.

CAI, GRPG, DEVM, ETHN, GEND (PS)

Glover, Geraldine C. (1994, December). An analysis of African-American junior high school students' mathematics achievement using Afrocentric, traditional, and parental involvement approaches: Implications for school administrators (Gallaudet University, 1994). *DAI, 55A*, 1498. [AAC 9429766]

Posttest scores were related to group membership but not to gender; the Afrocentric group had pretest scores below those of the other two groups but achieved significant gains during the study. Mathematics anxiety was related more to gender than group membership.

ETHN, SOC, ANX, GEND (MS)

Gonzalez Gomez, Rosa Maria. (1994, March). A descriptive study of verbal problems in selected mathematics textbooks at the high school (State University of New York at Buffalo, 1993). *DAI, 54A*, 3359. [AAC 9404811]

Analysis of three popular high school text series revealed more similarities than differences. Textbook problem-solving activities do not stimulate analysis or develop an attitude of inquiry. **MATL, PS (HS)**

Gooya, Zahra. (1994, February). Influences of metacognition-based teaching and teaching via problem-solving on students' beliefs about mathematics and mathematical problem-solving (The University of British Columbia, 1992). *DAI, 54A*, 2865. [AAC NN80876]

Forty students were classified as traditionalists, incrementalists, or innovators. After 60 hours of instruction, the latter two groups had changed their views about problem solving from application of rules to a process of creation and construction of knowledge.

MTCG, TCHG, BLF, PS (PS)

Gordon, Rudolph Giles, Sr. (1994, January). A study of the relationship between selected variables of mathematics teachers and student achievement in the middle school grades (University of South Carolina, 1993). *DAI, 54A*, 2404. [AAC 9400217]

None of the three teacher variables—area of certification, years of teaching experience, and teacher educational level—had a significant relationship with mathematics achievement in the middle schools (n=110) of South Carolina. **ACH, TCHR (MS)**

Greico, Linda Fletcher. (1994, March). The effectiveness of coupling a general format with a conceptual schema upon college algebra students' ability to solve mathematical word problems (University of South Florida, 1993). *DAI, 54A*, 3360. [AAC 9404900]

Students (n=55) who were given a format for solving specific kinds of problems did not perform significantly better than the control group except on a nonroutine problem. No significant gender differences were found, except that males outperformed females on the nonroutine problem. **PS, TCHG, ALG, GEND (PS)**

Grogan, Thomas Joseph. (1994, July). A data envelopment analysis of eighth grade mathematics instruction with a comparison of Catholic and public schools (University of Cincinnati, 1993). *DAI, 55A*. 59. [AAC 9416763]

Eighth-grade mathematics classes were evaluated for efficiency in mathematics instruction, using U.S. SIMS data. There were no differences in efficiency between classes in public and Catholic schools for the total sample or for the three achievement subgroups.

***TCHG, ACH, SOC* (MS)**

Gurney, Penelope J. (1994, May). On the association between modes of mental representation and mathematics experience in pre-service education students (University of Ottawa, 1992). *DAI, 54A*, 4037. [AAC NN83852]

Results indicate that differences do exist between the mental representation modes preferred by individuals with no mathematics experience compared to those who have even a small level of experience in mathematics. ***REP, PRSV* (K-12)**

Gutstein, Eric Howard. (1994, March). SIFT: A Self-Improving Fractions Tutor (The University of Wisconsin - Madison, 1993). *DAI, 54B*, 4775. [AAC 9330172]

A rule-based learning system, seSIFT—a Self-Improving Fractions Tutor—models what and how a human tutor might learn over the course of tutoring. seSIFT is based on a detailed study of a human tutor teaching fractions. ***LRNG, SOFT, FRAC* (EL)**

Hackett, Rachelle Kisst. (1994, June). Doing mathematics portfolios in a middle school classroom: A case study exploring an emerging alternative assessment practice (Stanford University, 1994). *DAI, 54A*, 4343. [AAC 9414573]

This study followed a mathematics teacher and her seventh-grade students throughout one school year as students selected and reflected on work and conferenced with the teacher. Test scores and attitudes of students who did and did not work with portfolios are contrasted.

***ASSM* (MS)**

Haimes, David Harold. (1994, September). The teaching and learning of introductory algebra: A case study of teacher actions and student outcomes in the context of two distinct curricula (University of Toronto, 1993). *DAI, 55A*, 498. [AAC NN86361]

Despite different orientations of the curricula, both teachers prioritized content coverage, emphasized methods for answering standard questions, and relied on teacher-focused pedagogy. Actions of the teacher, not the curriculum, determined students' perception of algebra.

***MATL, ALG, CC, TCHG* (SE)**

Hall, Linda A. (1994, April). A critical exploration of learning style preferences and the mathematical achievement of Chapter 1 middle school students: Administrative and instructional implications (Oklahoma State University, 1993). *DAI, 54A*, 3693. [AAC 9407244]

No significant differences between the mathematical achievement of Chapter 1, average achieving, and high achieving students (n=382) and learning style preferences were found.

***ACH, STYL* (MS)**

Halpern, Pamela Ann Pandolfo. (1994, August). The effects of enhancing the mathematics in children's trade books (Boston College, 1993). *DAI, 55A*, 235. [AAC 9414153]

Trade books containing mathematical concepts that were enhanced by adding explicit mathematical notation were significantly preferred over the original version. Symbolism encouraged rereading, made the mathematics more evident, and catalyzed discussion.

***LANG, WRIT* (EC)**

Hariki, Seiji. (1994, Spring). Analysis of mathematical discourse: Multiple perspectives (University of Southampton, 1992). *DAI, 55C*, 13. [NOT AVAILABLE]

Analysis of Complex Analysis textbooks showed that the discourse is neither standardized, nor objectively neutral, but is permeated by conflicts between logical, heuristic, and rhetorical schemes. ***LANG, WRIT, ADVM* (Ps)**

Harris, Marieta Wells. (1994, April). The effect of manipulatives on developing mathematics achievement and attitudes of seventh-grade students (Memphis State University, 1993). *DAI, 54A*, 3664. [AAC 9402982]

Students in the experimental group believed that manipulatives helped them understand perimeter and area and apply formulas appropriately. Evidence did not support that students in all ability level groups show higher achievement as a result of using manipulatives. ***MANP, ACH, ATT, MEAS* (MS)**

Harrison, Allyson Grainger Elgie. (1993, August). A follow-up study of adults identified in childhood as having a learning disability either in reading or in arithmetic (Queen's University at Kingston, 1992). *DAI, 54A*, 462. [AAC NN76361]

A 12-year follow-up of (n=51) adults suggests that learning disabilities produce a lifelong pattern of deficits. Findings have implications for remedial programs and emphasize the need to differentiate between different subgroups of learning disabilities. ***LD, D/R* (Ps)**

Hartig, Daniel Reed. (1994, September). Resolution of socio-cognitive conflict during mathematical problem-solving in student pairs: Effect of achievement level of partners and instructional format (The University of Wisconsin - Madison, 1993). *DAI, 55A*, 511. [AAC 9408719]

Data from (n=36) pairs of fifth-grade students showed that average/average achievement pairs attempted more resolutions per conflicting answer, achieved more consensus, and had greater gains in achievement than higher/lower pairs. ***ACH, GRPG, PS, SOC* (MS)**

Henry, Mary Janet. (1994, December). Hypermedia and the learning disabled student (West Virginia University, 1994). *DAI, 55A*, 1535. [AAC 9427964]

Learning disabled students (n=18) and developmental math students (n=18) participated in high control or low control HyperCard tutorials. Results showed no significant difference between the high and low control groups. ***DEVM, LD, SOFT, ACH, ATT* (Ps)**

Henry, Rita Jean. (1994, October). Evaluation of the second year of Project SMART, a science and math teacher enhancement program (Northern Arizona University, 1994). *DAI, 55A*, 935. [AAC 9424724]

Study concluded that Project SMART was effective in providing support and assistance to (n=38) rural teachers in their advancement of knowledge, skills, and attitudes and in their development as leaders in science and mathematics education. ***ISRV, TATT, TKNW* (K-12)**

Higginbotham, Cynthia Anne. (1994, June). Evaluation of spatial visualization pedagogy using concrete materials vs. computer-aided instruction (Texas Woman's University, 1993). *MAI, 32*, 781. [AAC 1355079]

This study compared the performance of college students (n=35) who experienced concrete vs. computerized spatial visualization instruction. The concrete group gained significantly more, and males outscored females. ***CAI, MANP, VIS, GEND* (Ps)**

Hight, Orian Langley. (1994, April). The effects of math confidence/study skills instruction on the mathematics achievement, attitudes, and study skills behavior of remedial math college students (University of Maryland College Park, 1993). *DAI, 54A*, 3664. [AAC 9407642]

There was a statistically significant improvement in math self-concept in favor of the treatment group (n=19), but there was not a significant difference in achievement over the control group (n=23). ***DevM, Tchg, Anx, Att* (Ps)**

Hoosain, Emamuddin. (1994, December). Teachers' conceptions and beliefs about mathematical problem-solving relative to high-ability and low-ability students (The Ohio State University, 1994). *DAI, 55A*, 1461. [AAC 9427713]

Results showed teachers (n=130) made a distinction between high- and low-ability students with respect to Frustration/Motivation, Computational skills/General ability, Affect, and Enjoyment, but not with respect to Textbooks/Materials, Technology, and Applications.
***Knw, PS, TBlf* (HS)**

Hopp, Carolyn Mae. (1994, September). Cooperative learning in a mathematics class and the influence of task on peer interactions (The University of Wisconsin - Madison, 1994). *DAI, 55A*, 498. [AAC 9410607]

Eighth-grade students (n=32) worked cooperatively in groups of four on two routine and two nonroutine tasks. Results suggest that a good group task needs to be nonroutine for everyone in the group, and group members must need each other in order to complete it.
***Grpg, PS* (MS)**

Hsieh, Che-Jen. (1994, March). Learning about linear functions in dynamic visual computer environments (University of Georgia, 1993). *DAI, 54A*, 3360. [AAC 9404656]

Three middle school students spent 20 hours learning about linear functions in a dynamic computer environment. Generation of meaning, interpretation of symbols, formulation of algebraic representations, and connection of slope to rate of change were observed.
***Rep, Soft, Alg* (MS)**

Hsu, Ay-Jiuan. (1994, July). Hypertext as a tool for construction of knowledge: Examining a fifth grader's learning process using a self-designed geometry stack on HyperCard (State University of New York at Buffalo, 1994). *DAI, 55A*, 42. [AAC 9412284]

The "knowledge and control of self" aspect of metacognition was addressed by incorporating documentation, buttons, and note pads at strategic points in the unit. Hypertext was judged versatile for facilitating teaching and learning congruent with the NCTM Standards.
***Mtcg, Soft, Geom* (MS)**

Hu, Fangduo. (1994, February). Mathematics education in the United States and China (Utah State University, 1993). *DAI, 54A*, 2868. [AAC 9402303]

Comparing textbooks (grades 1-12), homework, and time spent on mathematics instruction revealed that differences exist in the time spent on homework in the U.S. and China, and Chinese students received more instructional time on mathematics than American students.
***CC, Curr* (K-12)**

Isbell, Sharon Kay. (1994, January). Impact on learning of computer-assisted instruction when aligned with classroom curriculum in second-grade mathematics and fourth-grade reading (Baylor University, 1993). *DAI, 54A*, 2544. [AAC 9332416]

No significant differences in mathematics performance were observed between second graders who received CAI aligned with the classroom curriculum and those who received CAI using an integrated learning system following a sequence suggested by the vendor.
***CAI, Curr* (EC)**

Jenkins, Terry Lee. (1994, September). Enumeration strategies used by college students to solve combinatoric type problems (The University of Iowa, 1993). *DAI, 55A*, 499. [AAC 9421147]

Students (n=48) used four main strategies: listing, multiplying, generalizing, and diagramming. They tended to use listing to solve small-number problems and permutations; multiplying, to solve large-number problems and combinations. ***PROB* (PS)**

Jiang, Zhonghong. (1994, March). Students' learning of introductory probability in a mathematical microworld (University of Georgia, 1993). *DAI, 54A*, 3360. [AAC 9404659]

Three eighth-grade students, using a mathematical microworld named CHANCE, demonstrated four modes of thinking: naive-intuitive, experimental-intuitive, initial-systematic, and operational-systematic. ***PROB, SOFT, LRNG, REP* (HS)**

Johnson, Judith Mathis. (1994, April). Practical applications of computers in portfolio assessment for K-12 mathematics instruction (University of Oregon, 1993). *DAI, 54A*, 3694. [AAC 9405200]

Responses from (n=14) teachers who teach problem solving, integrate computer technology, and implement appropriate assessment methods recommend software that records student procedures so students can analyze their own thinking. ***ASSM, SOFT, TCHG* (K-12)**

Johnson, Laurence Franklin. (1994, February). Relationship of performance in developmental mathematics to academic success in intermediate algebra (The University of Texas at Austin, 1993). *DAI, 54A*, 2931. [AAC 9400914]

Data on (n=824) community college students show that developmental course performance is a significant discriminator of college-level mathematics performance and persistence; five other major conclusions are discussed. ***ALG, DEVM* (PS)**

Johnson, William Robinson. (1994, January). Success indicators for the Applied Mathematics Program in Georgia (Georgia State University, 1993). *DAI, 54A*, 2498. [AAC 9335064]

Fourteen factors were examined to see if they were indicators of success in Applied Mathematics in 37 high schools in Georgia. Attitudes did not have a significant influence. Students with experienced teachers achieved more but did not make better grades.
***ACH, LRNR, TCHR, ATT* (HS)**

Kaldor, Wendy Ruth. (1994, June). Relationships within and between operations in cognitive arithmetic (University of New South Wales, 1993). *DAI, 54B*, 6485. [NOT AVAILABLE]

Five experiments showed the strongest inter-operational associations between addition and subtraction and between multiplication and division. Further experiments examined intra-operational effects in arithmetic verification performance. ***A/S, M/D, LRNG* (EL)**

Kasparek, Rebecca Finley. (1994, February). Effects of integrated writing on attitude and algebra performance of high school students (The University of North Carolina at Greensboro, 1993). *DAI, 54A*, 2931. [AAC 9402483]

The experimental Algebra II group (n=34) achieved more on average than the control group (n=34). For the writing sample data, the experimental group performed higher on all chapter tests, suggesting that writing-to-learn mathematics can be a valuable instructional tool.
***WRIT, ALG, ATT* (HS)**

Keim, Andrea Schumann. (1994, May). Teachers' perception of South Carolina's mathematics curriculum framework draft (University Of South Carolina, 1993). *DAI, 54A*, 3977. [AAC 9410015]

Teachers' (n=12) perception of the framework's vision was positive, but school structure and support conflict with the vision. Principals' support was critical to teachers' belief in the possibilities of the framework. ***CURR, TATT, TBLF* (K-12)**

Keller, Brian A. (1994, May). Symbol sense and its development in two computer algebra system environments (Western Michigan University, 1993). *DAI, 54B*, 5704. [AAC 9410497]

CAS sections of beginning calculus used MAPLE (n=2) and THEORIST (n=2). Comparison with control sections (n=2) showed virtually no differences. The manner of symbolic manipulation may not be a factor in students' development of symbol sense.

***ALG, SOFT, CII, CALS* (Ps)**

Kim, Sun-Young. (1994, March). The relative effectiveness of hands-on and computer-simulated manipulatives in teaching seriation, classification, geometric, and arithmetic concepts to kindergarten children (University of Oregon, 1993). *DAI, 54A*, 3319. [AAC 9402024]

Both the hands-on group (n=17) and the on-screen group (n=18) made significant gains in geometry, classification, and arithmetic. Differences between the groups were not significant ***MANP, SOFT, ARTH, GEOM* (EC)**

Kim, Young-Sun. (1994, September). The relationship between the performance on Piagetian tasks in kindergarten and arithmetic achievement in first-grade in Korea (Arizona State University, 1994). *DAI, 55A*, 464. [AAC 9422058]

Piagetian tasks, especially seriation and transitivity, were better predictors of arithmetic achievement in first grade than the WISC-R vocabulary or block design tests for Korean kindergartners (30 males, 30 females). No systematic sex differences were found.

***ARTH, ASSM, LRNG, GEND* (EC)**

Kincheloe, J. Bradford. (1994, November). The effect of directed parental involvement in achievement (University of Missouri - Kansas City, 1994). *DAI, 55A*, 1214. [AAC 9427403]

Data from two Math Analysis classes provide no evidence that (1) sending specially designed study materials home to parents increases achievement or (2) there is a positive correlation between the amount of parental help with homework and student achievement.

***ACH, SOC, CALS* (HS)**

King, Nancy Tervalon. (1994, February). A study of the validity of the Texas Academic Skills Program test in an open admissions urban university (University of Houston, 1993). *DAI, 54A*, 2932. [AAC 9401801]

This study addressed the question of the validity of the TASP test for predicting performance (n=4000) in college mathematics courses for students who require remediation as well as it does for students who do not require remediation. ***ASSM, DEVM, ACH* (Ps)**

Klein, Thomas Joseph. (1994, May). A comparative study on the effectiveness of differential equations instruction with and without a computer algebra system (Peabody College for Teachers of Vanderbilt University, 1993). *DAI, 54A*, 4021. [AAC 9412432]

Mathematica used as a demonstration tool in two sections of differential equations did not improve achievement over two control sections. Computer attitudes changed significantly, but the classes did not attribute these changes to Mathematica.

***ADVM, SOFT, ACH, ATT, CII* (Ps)**

Klig, Victor. (1994, June). The effect of representation on learning to reason with problems involving computer program-oriented complex logic (Columbia University, 1991). *DAI, 54A*, 4382. [AAC 9412877]

For reasoning with computer-program-oriented complex logic, visual representations of the logic appeared more effective than verbal representations. ***PS, REP, DSCM* (Ps)**

Kosmicki, James Joseph. (1994, January). The effect of differential test instructions on math achievement, effort, and worry of community college students (University of Southern California, 1993). *DAI, 54A*, 2548. [NOT AVAILABLE]

Data on (n=264) students showed significant correlations among metacognition, worry, and math achievement scores. Asian and African-American group scores were lower than those for Latino and White groups. Asian students worried more than the other three ethnic groups. ***Ach, Assm, Anx, Ethn* (Ps)**

Kunicki, Joseph Alexander. (1994, September). The effects of impertinence upon the validity of a process model of mathematics achievement and attitude (The Ohio State University, 1994). *DAI, 55A*, 499. [AAC 9420976]

The K-Index screening process partitioned a large-scale data set (LSAY) to eliminate nonrandom respondent error without compromising the demographic balance inherent in the original sample. ***Assm, Ach, Att* (K-12)**

Kwak, Eunsoon. (1994, September). Instructional computers in high school mathematics reform: Its theory and practice (The Ohio State University, 1994). *DAI, 55A*, 458. [AAC 9420978]

A case study of two high schools showed that existing organizational routines, faculty culture, and resources influenced the degree to which instructional computer activities were implemented. ***CII, Curr, Soc, TBlf* (HS)**

Lai, William Yu-Kwong. (1994, May). The influence of written teacher comments and differing amounts of homework upon student achievement in basic mathematics (The Union Institute, 1993). *DAI, 54A*, 4021. [AAC 9332477]

Data from six intact classes showed that the "quizzes with teacher comments" group had significantly higher achievement scores than the "quizzes without teacher comments" or the "no quiz" groups, but there was no difference between the two homework groups. ***Ach, Assm, Writ, Ethn* (HS)**

Langrall, Cynthia Willey. (1994, April). Cognitive constructivist perspectives on place-value instruction in second-grade classrooms (University of Maryland College Park, 1993). *DAI, 54A*, 3665. [AAC 9407655]

All four teachers were influenced, but to different degrees, by the research-based knowledge pertaining to the teaching and learning of place-value concepts and the theory of cognitive constructivism. Each classroom showed significant gains in place-value concepts. ***Isrv, Lrng, PlcV* (EC)**

Lanich, James Stephen. (1994, December). Impact and effectiveness issues related to mathematics distance education for parents, children and teachers (University of Southern California, 1994). *DAI, 55A*, 1462. [NOT AVAILABLE]

Data from three case study sites showed: (1) Parents and teachers experienced mutual empathy, (2) Parent understanding of math concepts increased through activities with their children, and (3) Technology caused teachers stress because they lacked the necessary skills. ***Tchg, Tech, Soc* (EC)**

Lato, Robert G. (1994, September). A group intervention designed to lessen mathematics anxiety, improve attitude and achievement in math among male grade 9 high school students (University of Toronto, 1993). *DAI, 55A*, 499. [AAC NN86348]

Students in the intervention group showed a significant decline in math anxiety and improvement in attitudes. There was no significant improvement in achievement. ***Soc, Tchg, Anx, Att, Gend* (HS)**

Latson, Hazel Marie. (1994, October). A description of bi-directional student-teacher influence in urban middle school math classes (Miami University, 1994). *DAI, 55A*, 889. [AAC 9424050]

Students (n=196) from four urban middle schools participated in this investigation of the influence of student "voice" in a lesson. Average-achieving students stimulated significantly more positive teacher responses than high- or low-achieving students.

***ORAL, TCHG, ACH* (MS)**

LeBlanc, Mark David. (1994, January). A computer model of the role of text integration in the solution of arithmetic word problems (University of New Hampshire, 1993). *DAI, 54B*, 3710. [AAC 9400391]

This study presents a computer model of the hypothesized processes that are required of a young student solving arithmetic word problems, including sentence-level reading and text integration. Results suggest new process-oriented measures of problem difficulty.

***LANG, REP, ARTH, PS* (EC)**

Lee, Deborah Baker. (1994, February). Assessing and describing sixth-grade students' use of number sense to demonstrate an understanding of mathematics concepts (Auburn University, 1993). *DAI, 54A*, 2886. [AAC 9402088]

Most of the sixth-grade students (n=18) did not demonstrate a good development of number sense. The majority demonstrated a poor understanding of estimation using whole numbers and fractions.

***NSNS, EST, FRAC, M/D* (MS)**

Lee, Martha Jean. (1994, February). A system appropriate intervention for widespread math deficiency (The University of Southern Mississippi, 1993). *DAI, 54B*, 4375. [AAC 9402537]

A class of (n=14) second graders showed improvement on addition and subtraction facts after repeated practice and self-corrective feedback.

***D/R, A/S* (EC)**

Lee, Raymond Ellis. (1994, February). The effects of a problem-solving program utilizing environmental issues on achievement of Finite Mathematics students (The American University, 1992). *DAI, 54A*, 2932. [AAC 9403340]

Two sections of Finite Mathematics that solved problems involving environmental issues demonstrated more interest and verbal interaction than two control sections.

***CURR, PS, ACH, AFF, DSCM* (Ps)**

Lee, Sylvia Wu. (1994, April). Spatial ability and achievement in geometry among Taiwanese high school students (University of Maryland College Park, 1993). *DAI, 54A*, 3694. [AAC 9407658]

Tenth-grade students (n=310) in Taiwan showed significant sex differences in geometry achievement and spatial ability favoring males. Both spatial ability and logical reasoning were positively correlated with geometry achievement.

***GEOM, VIS, ACH, ETHN, GEND* (HS)**

Leiker, Virginia Carol. (1994, May). The relationship between an integrated learning system, reading and mathematics achievement, higher-order thinking skills and certain demographic variables: A study conducted in two school districts (Baylor University, 1993). *DAI, 54A*, 4067. [AAC 9411538]

Among third and fourth graders in two school districts the greatest amount of variance in higher order thinking skills was attributed to grade level; in mathematics and reading performance, to SES.

***ACH, CAI, ETHN, GEND, SOC* (EC)**

Lindberg, Virginia Lesa B. (1994, February). Insight into mathematics anxiety: A focus on locus-of-control, mathematics attitude, and parental perceptions as related to mathematics anxiety in seventh-grade students (Memphis State University, 1993). *DAI, 54A*, 2932. [AAC 9402994]

Results indicated no difference in the locus of control and mathematics attitude between anxious (n=10) and non-anxious (n=10) students. Parents of anxious students had higher expectations. Anxious students liked journals, and 70% were from non-traditional families.

***ANX, ATT, PERS, SOC, WRIT* (MS)**

Liu, Shiang-Tung. (1994, June). Effects of teaching calculator use and problem-solving strategies on mathematics performance and attitude of fifth-grade Taiwanese male and female students (Memphis State University, 1993). *DAI, 54A*, 4345. [AAC 9414962]

Among fifth-grade Taiwanese students (n=193) males had better attitudes toward mathematics than females. Combining the use of calculators and problem solving seems to be more effective than either strategy alone.

***CALC, PS, ATT, GEND* (MS)**

Loynd, John Thomas, Jr. (1994, October). The effects of integrated visual/algorithmic learning on retention of converting fractions to percents (University of Lowell, 1994). *DAI, 55A*, 896. [AAC 9423786]

After 90 minutes of instruction for (n=140) ninth graders, an integrated visual/algorithmic approach to converting fractions to percents seemed to produce better retention than either visual or algorithmic approaches alone.

***TCHG, FRAC, PCT* (HS)**

Luce, Chrislyn Zellars. (1994, August). The effects of the Family Math parental involvement program on students' cognitive and affective behaviors and parents' attitudes toward education (The University of Southern Mississippi, 1993). *DAI, 55A*, 235. [AAC 9417835]

Data on (n=92) fourth- and fifth-grade students and their parents showed that participation in the Family Math program contributed to improved attitudes, reduced anxiety, increased time parents worked with children, and more enjoyment of that time.

***MATL, SOC, ACH, ANX, ATT* (EL)**

Ma, Hsiu-Lan. (1994, November). A comparative study between traditional instruction and modified multimedia instruction in mathematical problem-solving achievements and beliefs of sixth-grade students in Taiwan, the Republic of China (University of Northern Colorado, 1994). *DAI, 55A*, 1214. [AAC 9427451]

This study of (n=90) sixth-grade students in Taiwan showed no significant difference in problem solving or beliefs between the modified multimedia and traditional groups, and gender did not play a significant role in the mean scores on either instrument.

***TCHG, TECH, BLF, GEND, PS* (MS)**

Madden, James Michael. (1994, March). Informal systematic analysis of performance in adding and subtracting fractions and mixed numbers: Toward a conceptual framework for constructing and evaluating inferences about domain-specific knowledge of individuals (The University of Saskatchewan, 1991). *DAI, 54A*, 3400. [AAC NN82969]

Responses to 112-116 questions by (n=481) seventh graders in six groups support the contention that teachers can formulate accurate judgments concerning how an individual will respond to a particular item based on limited samples of observed behavior.

***ASSM, D/R, A/S, FRAC* (MS)**

Majdalani, Mona Charly. (1994, June). The impact of a constructivist framework on preservice teachers' number sense concepts and their beliefs and attitudes about the teaching and learning of mathematics: An exploratory study (Texas A&M University, 1993). *DAI, 54A*, 4347. [AAC 9411305]

Preservice teachers' (n=22) number sense and self-efficacy beliefs, but not attitudes toward teaching and learning mathematics, improved during a problem-centered elementary methods course.

***NSNS, PRSV, TATT, TBLF* (EL)**

Mallon, Jacqueline Ann. (1994, Winter). Gender and undergraduate mathematics students: Attitudes, beliefs and perceived sources of encouragement/support (Queen's University of Belfast, 1993). *DAI, 55C*, 1334. [NOT AVAILABLE]

Four studies (n=196; 103; 209; 20) indicate that women math majors are positive about the value of mathematics and about themselves as mathematics learners but require frequent feedback on their performance. The importance of role models was noted.

***AFF, GEND, SOC* (Ps)**

Martin, William O. (1994, April). Lasting effects of the integrated use of graphing technologies in precalculus mathematics (The University of Wisconsin - Madison, 1993). *DAI, 54A*, 3694. [AAC 9404735]

Data from (n=18) precalculus students showed: (1) Graphing technologies have a lasting impact on students even when their use is discouraged or prohibited; (2) Students do not become sophisticated users nor gain lasting enhancements of conceptual knowledge in only one semester.

***CALS, GCAL* (Ps)**

Massey, Julia England. (1994, August). The study of a learning situation modeled on the van Hiele theory with emphasis on the vocabulary of the student (The University of Alabama, 1993). *DAI, 55A*, 235. [AAC 9417147]

One-on-one teaching experiments with (n=9) rising geometry students suggest a direct relationship between vocabulary and van Hiele level; prior memorization interfered with new learning; and manipulatives were an invaluable teaching tool.

***GEOM, LANG, LRNG, MANP* (HS)**

Mathews, Susann Miller. (1994, December). The effect of using as many variables as are needed to solve word problems on the problem-solving skills and attitudes of students in Algebra I (The Ohio State University, 1994). *DAI, 55A*, 1498. [AAC 9427751]

Four teachers each taught (a) an experimental and (b) a control section to solve two-variable word problems using (a) two explicit variables or (b) one explicit and one implicit variable. The experimental groups scored significantly higher on word problem tests.

***ALG, PS, ATT, CURR* (HS)**

Mau, Mary Sue Tinsley. (1994, August). Ways of knowing and ways of teaching: Conflicting expectations in a developmental mathematics classroom on a college campus (Indiana University, 1993). *DAI, 55A*, 235. [AAC 9418797]

Four undergraduates and four teaching assistants involved in a remedial mathematics course expressed concerns about time, making personal and mathematical connections, and authority. The students wanted to know how learning mathematics would make a difference in their lives.

***DEVM, TCHG, BLF, TBLF* (Ps)**

Maxwell, Sheryl Anne. (1994, October). The needs of second career, secondary mathematics teachers: How well are they met by academic programs and inductive processes? (University of Virginia, 1994). *DAI, 55A*, 897. [AAC 9424462]

Case studies of five second career, secondary mathematics teachers show that specially designed programs, formal mentoring, and additional preparation in technology, exceptionality, and multicultural education are warranted for second career interns.

***CURR, PRSV* (SE)**

McAdoo, Penny Coyne. (1994, October). The effect of professional development in performance assessment on mathematics achievement and attitude (University of North Texas, 1994). *DAI, 55A*, 854. [AAC 9424389]

Six fourth-grade teachers participated in professional development in the use of performance assessment; five did not. Concerns that performance tasks for assessment will detract from mathematics achievement on traditional standardized tests may be unwarranted.

***Assm, Isrv, Ach, Att* (EC)**

McGlamery, Sheryl Lynne. (1994, January). Teacher learning, curriculum change, and the culture of mathematics classrooms (The Florida State University, 1993). *DAI, 54A*, 2498. [AAC 9332309]

Two teachers found metaphors for their roles to be useful constructs in reflecting on teaching and learning; they were profoundly influenced by the cultural myths of their school; and reframing and reflection were the foundation of personal learning and curricular change.

***Curr, Isrv, TBlf* (HS)**

McKernan, Margaret McCabe. (1994, February). The effects of 'Mathematics Their Way' and Chicago Math Project on mathematical applications and story problem strategies of second graders (Drake University, 1992). *DAI, 54A*, 2932. [AAC 9332572]

After 27 weeks using traditional instruction, Mathematics Their Way, or UCSMP materials, there were no significant differences on a test of problem solving and application across (n=250) second graders when pretest, age, and IQ were controlled. ***Matl, Manp, PS* (EC)**

McMann, Patricia Kovach. (1994, October). The effects of teaching practice review items and test-taking strategies on the ACT mathematics scores of second-year algebra students (Wayne State University, 1994). *DAI, 55A*, 897. [AAC 9423737]

Students (n=99) who were given spaced practice on sample ACT mathematics questions and test-taking strategies outscored students (n=97) in the control group. Gender and number of years of math were not significant factors. ***Ach, Curr, Alg, Gend* (HS)**

Meeks, Wendell Arthur. (1994, February). The effects of classroom ability grouping on eighth-grade student achievement in mathematics (Southern Illinois University at Carbondale, 1993). *DAI, 54A*, 2933. [AAC 9403100]

Eighth graders (about 25% African-American) were grouped homogeneously (n=485) or heterogeneously (n=601) by ability. There was a significant difference in mathematics scores in favor of homogeneous grouping for whites but not for African-Americans.

***Ach, Grpg, Ethn* (MS)**

Menon, Ramakrishnan. (1994, February). Writing to learn mathematics: Student journals and student-constructed questions (The University of British Columbia, 1992). *DAI, 54A*, 2872. [AAC NN80895]

Sixth graders wrote in journals and constructed questions about fractions individually and in groups. The questions revealed implicitly and explicitly more about their knowledge of fractions than their journal writing did. ***Writ, Frac, PS* (MS)**

Mikusa, Michael Gerald. (1994, September). How students establish the truth of their ideas in school geometry (Kent State University, 1993). *DAI, 55A*, 499. [AAC 9422419]

Interviews with (n=32) students in grades 2, 5, 7, and high school geometry suggested 16 primary components to students' arguments. Second and 5th graders were most likely to draw pictures. High school students and 7th graders were more likely to use Intuitive Affirmation.

***Geom, Prf* (K-12)**

Millican, Beverly Robinson. (1994, October). The effects of writing-to-learn tasks on achievement and attitude in mathematics (University of North Texas, 1994). *DAI, 55A*, 897. [AAC 9424391]

Significant differences in fourth graders' achievement were found in favor of the writing-to-learn treatment (4 classes) and contrast (4 classes) groups as a whole, for females, and for low-achieving students. No differences in attitude toward mathematics were found.

***ACH, WRIT, ATT, GEND* (EC)**

Mittag, Kathleen Cage. (1994, February). A Delphi study to determine standards for essential topics and suggested instructional approaches for an introductory non-calculus-based college-level statistics course (Texas A&M University, 1993). *DAI, 54A,* 2933. [AAC 9403559]

Experts (n=29) in statistics education, participating in three iterations of a Delphi study, suggest that 49% of the statistics course should be data-based, 28% computer-based, 13% probability-based and 10% other approaches such as labs, projects, and case studies.

***CURR, STAT, TCHG* (PS)**

Moore, Patrick Joseph. (1994, May). A comparison of beliefs related to the teaching of mathematics in teacher-trainees and experienced elementary school teachers (City University of New York, 1993). *DAI, 54A,* 4041. [AAC 9405562]

Teacher-trainees' (n=108) beliefs differed significantly from those of experienced teachers (n=107). Experienced teachers scored higher on self-measures of ability in mathematics, teacher efficacy, and personal efficacy for teaching mathematics. ***TBLF, PRSV, TCHR* (EL)**

Moore, Sara Delano. (1994, November). Mathematical and verbal abilities as factors in mathematical problem-solving by talented students (University of Virginia, 1994). *DAI, 55A,* 1215. [AAC 9425758]

Students (n=53) of high verbal ability and (a) above average or (b) exceptional mathematical ability solved multistep problems. Exceptional math students were more likely to use diagrams, while above-average math students showed only computational work.

***GIFT, PS, KNW* (EL)**

Morton, Lynda Sue Kalkwarf. (1994, May). Verbal communication in college algebra classrooms: Quality, patterns and relationship to student performance (University of Missouri - Columbia, 1993). *DAI, 54A,* 4021. [AAC 9412505]

One class each from (n=10) experienced instructors was analyzed to identify patterns of verbal communication. Results indicated a modest relationship between quality of verbal communication and student achievement. ***ORAL, ACH, ALG* (PS)**

Moynihan, Christine Mary. (1994, December). A model and study of the role of communication in the mathematics learning process (Boston College, 1994). *DAI, 55A,* 1462. [AAC 9428784]

Instruction in cubic units was augmented by journal writing and sharing in three experimental fifth-grade classes; instruction in fractions, in two experimental classes. There was a significant difference in achievement for students engaged in the experiment for a longer period of time. ***ACH, WRIT, AFF, FRAC, MEAS* (MS)**

Mudge, Marilyn. (1994, February). Beliefs and practices of Nebraska K-8 teachers as related to the standards for teaching mathematics of the 'Professional Standards for Teaching Mathematics' (University of South Dakota, 1993). *DAI, 54A,* 2933. [AAC 9401979]

Responses from (n=370) K-8 teachers suggest that practices consistent with the Standards were more likely in grades K-2 and Chapter I classrooms and less likely in grades 3-5 and multiple-grade classrooms. Teachers who were more aware of the Standards reported higher levels of consistency. ***TBLF, TCHG* (EL)**

Mukunda, Kamala Vijayalakshmi. (1994, February). The suppression of irrelevant inferences in mathematical word problem solving (Syracuse University, 1993). *DAI, 54B*, 4418. [AAC 9401698]

Third and seventh graders solved and later recalled six long and six short word problems. Performance on the problems was negatively related to the proportion of irrelevant inferences recalled from long problems. ***LANG, PS* (EL)**

Mwerinde, Patrick Fulgence. (1994, February). Needs, uses and training facilities for statistical personnel in three African nations (Columbia University Teachers College, 1993). *DAI, 54A*, 2913. [AAC 9402658]

Few teacher training colleges in Uganda, Nigeria, and Morocco prepare prospective teachers in statistics, and senior secondary school curricula do not include statistics. ***PRSV, STAT* (SE)**

Nash, Linda Elrod. (1994, January). What they know vs. what they show: An investigation of teachers' practices and perceptions regarding student assessment (Georgia State University, 1993). *DAI, 54A*, 2498. [AAC 9335068]

Three case studies describe the implementation of portfolio assessment, mathematics projects, and contracting for grades.These new assessment methods are appropriately modified when teachers purposefully reflect on the effectiveness of the new method. ***ASSM, MTCG* (EL)**

Nayer, Sofya. (1994, October). United States and Russian calculus achievement examinations: A comparison of student performance (Columbia University Teachers College, 1994). *DAI, 55A*, 898. [AAC 9424533]

American and Soviet students each took both the AP Calculus exam and the Soviet entrance exam. The exams and corresponding course syllabi were compared to see if differences in exam results were attributable to curricular emphases. ***ACH, CALS, CC, CURR* (HS)**

Newsome, David Leroy. (1994, June). Development of a computer-based experience in mathematics education for preschool children (Columbia University Teachers College, 1993). *DAI, 54A*, 4414. [AAC 9414447]

This study describes the development and formative evaluation of a computer program designed to enhance, broaden, and amplify the informal counting skills of preschool children (n=6). ***NSNS, SOFT* (EC)**

Nhlengetfwa (Lafakudze), Josephine Thulisiwe. (1994, February). The impact of mathematics/science inservice teacher education programs on the Manzini region (Swaziland) elementary schools (Ohio University, 1993). *DAI, 54A*, 2872. [AAC 9335077]

Survey responses by (n=109) elementary teachers, interviews of (n=10) teachers, and classroom observations of 12 different lessons suggest a positive impact of the math/science inservice education programs provided since the early 1980s. ***ISRV, TCHG* (EL)**

Nichols, Joey Del. (1994, September). The effects of cooperative learning on student achievement and motivation in a high school geometry class (The University of Oklahoma, 1994). *DAI, 55A*, 460. [AAC 9422561]

Students (n=81) were randomly assigned to two treatment (STAD) and one control group. Treatment groups experienced higher achievement scores and increases in goal orientation, self-efficacy, intrinsic valuing, and reported uses of deep processing cognitive strategies. ***ACH, AFF, GRPG, GEOM* (HS)**

O'Connell, Ann Aileen. (1994, June). A classification of student errors in probability problem-solving (Columbia University Teachers College, 1993). *DAI, 54A*, 4382. [AAC 9414449]

Probability problem solutions of (n=30) undergraduate and (n=50) graduate students were coded according to the types of errors found. Text comprehension errors accounted for 15-23% of all errors and procedural difficulties accounted for 45% of the errors.

***D/R, Prob, PS* (Ps)**

O'Neal, Judy Summers. (1994, January). Restructuring a mathematics program using the NCTM 'Standards' and outcome-based education (Georgia State University, 1993). *DAI, 54A*, 2499. [AAC 9335069]

Middle school (n=25) and high school (n=25) teachers participated in a 15-month, 3-phase project to redesign the 6-12 mathematics program. Issues were studied, a framework was constructed, and a model for prototypical instructional units was developed.

***Curr, Isrv* (Se)**

Olson, Jean Kathryn. (1994, June). Semantic construction of relationships in curriculum of Algebra II and Chemistry (The Florida State University, 1993). *DAI, 54A*, 4402. [AAC 9413293]

Eleven assertions related to problem solving, course applications, course integration, linguistic register, and student perceptions were used to enhance understanding of student difficulty in integrating knowledge between Algebra II and Chemistry. ***Alg, IC, Lang, PS* (HS)**

Onwuegbuzie, Anthony John. (1994, June). The interaction of statistics test anxiety and examination condition in statistics achievement of post-baccalaureate non-statistics majors (University of South Carolina, 1993). *DAI, 54A*, 4371. [AAC 9410034]

Graduate students (n=26) took statistics tests under timed or untimed conditions. All students performed better under untimed conditions, but high-anxious students showed a greater increment in performance. ***Ach, Anx, Stat* (Ps)**

Oropesa, Leticia Marie. (1994, June). Mathematics anxiety and course content: In search of a discrete correlation (University of Miami, 1993). *DAI, 54A*, 4382. [AAC 9412919]

Because incoming students reported low to moderate math anxiety, a discrete math course designed to reduce math anxiety did not produce a significant effect.

***Curr, DscM, Anx, Gend* (Ps)**

Ostler, C. Elliott. (1994, February). The use of written systematic solutions as models for problem solution enhancement in intermediate algebra (University of South Dakota, 1993). *DAI, 54A*, 2873. [AAC 9401982]

Eleven students scored higher on unit tests when instruction included detailed, written systematic solutions of conic sections equations (circle, hyperbola) than when it did not (parabola, ellipse). ***Writ, Alg* (HS)**

Ottinger, Thomas Patrick. (1994, February). Conceptual and procedural learning in first-year algebra using graphing calculators and computers (Georgia State University, 1993). *DAI, 54A*, 2934. [AAC 9335070]

Students in the experimental group (n=39), who spent 18 weeks on concept development and then 6 weeks on procedures, had just as good skills and better understanding than students in the control group (n=54), who spent 24 weeks on traditional skills.

***Lrng, Tchg, Alg, Comp, GCal* (HS)**

Owen, Lisa Baughman. (1994, June). Fostering constructivism in an elementary mathematics classroom (The University of Texas at Austin, 1993). *DAI, 54A*, 4355. [AAC 9413564]

A case study of a second-grade teacher shows how she created a safe environment to foster constructivism. She forced students to think as problems were posed and encouraged them to verbalize their reflections, discuss their ideas, and agree or disagree.

***Oral, Tchg, Lrng* (EC)**

Paredes, David Richard. (1994, June). Sources and consequences of developing skill in mental addition: A comparison of U.S. and Chinese grade school children (The University of Texas at Austin, 1993). *DAI, 54B*, 6481. [AAC 9413567]

Chinese students were faster at all mental addition tasks than U.S. students in the same, or higher, grades. Speed of mental rotation did not differ significantly, but Chinese students made remarkably more errors. ***CC, A/S* (EL)**

Parham, James Wallace. (1994, May). An analysis of the effects of tutoring on seventh grade students engaged in the mastery of pre-algebra concepts (University of Maryland College Park, 1993). *DAI, 54A*, 4021. [AAC 9407677]

Same-age, trained tutors made a significant and positive difference in the mastery of pre-algebra concepts. ***TCHG, ALG* (MS)**

Parnell, Brenda Dutton. (1994, February). A comparison of Advanced Placement Calculus students' and other students' success in the first two semesters of college calculus (Auburn University, 1993). *DAI, 54A*, 2974. [AAC 9402097]

First semester results (n=348) indicated that AP Calculus students achieved highest, followed by non-AP Calculus students, and then high school Precalculus students. The effect of taking calculus in high school seemed to disappear by the end of second semester calculus. ***ACH, CALS* (PS)**

Parsons, Roger Ray. (1994, February). Teacher beliefs and content knowledge: Influences on lesson crafting of preservice teachers during geometry instruction (Washington State University, 1993). *DAI, 54A*, 2934. [AAC 9402918]

Case studies of three preservice teachers showed that a teacher operating at van Hiele level *n* tended to describe concepts and choose activities at level *n* or *n*-1. The teacher's beliefs about geometry also influenced the crafting of lessons. ***PLAN, TKNW, GEOM, LRNG, PRSV, TBLF* (EL)**

Perie, Marianne. (1994, November). Differential performance on mathematics achievement between the sexes explained through differential strategy selection (University of Virginia, 1994). *DAI, 55A*, 1250. [AAC 9425685]

High school students (n=171) solved four types of SAT problems and indicated the strategies they used. Certain strategies were found to be strongly associated with high scores, but the relationship between gender and strategy use remained unclear. ***ACH, PS, ASSM, GEND* (HS)**

Perlwitz, Marcela D. (1994, March). Analysis of the reflexivity between languaging and children's construction of concepts of ten (Purdue University, 1993). *DAI, 54A*, 3360. [AAC 9403769]

Analysis of 13 lessons in a second-grade classroom indicates that the linguistic activity of individual children and of the group influenced children's conceptualization of ten. Conversely, children's cognitive advances influenced the linguistic activity of individuals and of the group. ***LANG, PLCV, ORAL* (EC)**

Peterson, Winnie J. (1994, April). Alternative assessment in mathematics: A reporting of implementation at the state level (Temple University, 1993). *DAI, 54A*, 3694. [AAC 9408816]

Survey data from (n=31) states indicate that 20 states are using one or more forms of alternative assessment—free response items, open-ended questions, performance tasks, or portfolios—at the state level. ***ASSM* (K-12)**

Phalavonk, Utompom. (1994, August). Achievement and motivational effects of computer-assisted instruction for university mathematics in Thailand (University of New South Wales, 1991). *DAI, 55A*, 236. [NOT AVAILABLE]

Science students (n=960) experienced a CAI or non-CAI approach to a required math course. Achievement and attitude/interest scores of the CAI students were significantly higher than those of the non-CAI students. ***CAI, ACH, AFF* (Ps)**

Pierson, Karen Perry. (1994, January). Effectiveness of development courses and the voluntary placement system at an Iowa community college (Iowa State University, 1993). *DAI, 54A*, 2438. [AAC 9335009]

Data on students (n=480) participating in a voluntary algebra placement system showed that ASSET Numerical Skills are valid predictors for Elementary Algebra, but ASSET Elementary Algebra scores are not valid predictors for Intermediate Algebra. ***DEVM, ALG, ASSM* (Ps)**

Piliero, Susan C. (1994, November). The effects of a problem-based curriculum, multi-representational software, and teacher development on the knowledge, beliefs and practices of a secondary mathematics teacher (Cornell University, 1994). *DAI, 55A*, 1215. [AAC 9427876]

The participating teacher's knowledge and beliefs about mathematics were influenced by her use of software and the problem-based curriculum. Evidence of the teacher's development was found in her planning, instruction, reflection, and assessment practices.
***CURR, SOFT, ISRV* (HS)**

Poppe, Pamela Elizabeth. (1994, June). Representations of function and the roles of the variable (Georgia State University, 1993). *DAI, 54A*, 4383. [AAC 9409911]

Two Algebra I classes participated in a teaching experiment that investigated students' use of variables when instruction utilized different representations of function. These students showed more improvement in generalizing patterns than four control classes.
***ALG, REP, TCHG* (HS)**

Quinn, Robert John. (1994, August). The effects of mathematics methods courses on the mathematical attitudes, content knowledge, and pedagogical beliefs of preservice teachers (University of Nevada, Las Vegas, 1993). *DAI, 55A*, 236. [AAC 9416122]

Results suggest that methods courses provide important experience in the use of manipulatives, technological aids, and cooperative learning, but preservice teachers (n=47) worry that they may have trouble implementing these methods themselves.
***PRSV, ATT, TBLF, TKNW* (K-12)**

Rasimas, Judith Ann. (1994, June). TELLS (Testing for Essential Learning and Literacy Skills): The impact and implications of a state-mandated remedial program (University of Pennsylvania, 1993). *DAI, 54A*, 4348. [AAC 9413892]

"One best system" reform mandates tend to ignore the idiosyncratic needs of rural school districts, which may lack sufficient personnel and financial resources to implement reforms.
***CURR, D/R, ASSM* (K-12)**

Raymond, Anne Miller. (1994, March). Understanding relationships between beginning elementary teachers' mathematics beliefs and teaching practices (Indiana University, 1993). *DAI, 54A*, 3314. [AAC 9404352]

A study of six teachers showed that prior school and teaching experiences were the primary influences on the teachers' beliefs, and the beliefs plus the behavior and ability of students were the key influences on the teachers' practices. ***TBLF, TCHG* (EL)**

Rechm, Sue Plympton. (1994, January). A comparison of estimation processes used on numeric and contextual problems (University of Missouri - Columbia, 1992). *DAI, 54A*, 2499. [AAC 9400056]

Fourteen eighth graders at each of three estimation performance levels solved 10 numeric problems and 10 contextual problems. Students in the low and middle groups gave more acceptable responses for numeric problems; in the high group, for contextual problems.

***Est* (MS)**

Reeves, Mary E. (1994, September). Mathematics and gender: A general history of recent research and common perceptions (The Louisiana State University and Agricultural and Mechanical College, 1993). *DAI, 55A*, 500. [AAC 9419919]

Fundamental to the discourse on gender differences is the notion of equal ability, but the goal of this research is not to force females to pursue mathematics to the same level as males, but to improve mathematics teaching and learning for all students. ***Gend* (All)**

Reid, David A. (1994, February). Mathematical induction: An epistemological study with consequences for teaching (Concordia University, 1992). *MAI, 32*, 27. [AAC MM80943]

Six students could use recursive thinking informally, but mathematical induction on a formal level was achieved by only three. It was concluded that teaching that makes a connection between informal recursion and mathematical induction would be more successful.

***Prf* (Ps)**

Richgels, Glen William. (1994, May). The role of students' beliefs about mathematics in the learning of the mathematical definition of limit (The University of Wisconsin - Madison, 1993). *DAI, 54A*, 4022. [AAC 9330838]

Responses of (n=23) high school students showed there are connections between the formal limit concept and (1) student beliefs about the validity of a mathematical technique and (2) student beliefs about the concept of limit. ***Blf, Cals* (HS)**

Rickard, Anthony Dane. (1994, April). Teachers' use of a problem-solving oriented sixth-grade mathematics unit: Two case studies (Michigan State University, 1993). *DAI, 54A*, 3695. [AAC 9406545]

A study of how two sixth-grade teachers used a problem-solving oriented unit on perimeter and area suggests that, while the curriculum can play a role in shaping mathematics teaching, the views, beliefs, and knowledge of teachers should also be addressed.

***Curr, PS, Meas, TBlf, TKnw* (MS)**

Roberts, Frank Henry. (1994, December). The impact of the Saxon mathematics program on group achievement test scores (The University of Southern Mississippi, 1994). *DAI, 55A*, 1498. [AAC 9430198]

This study compared gains on the SAT of students in two rural Mississippi counties. On the Mathematics Computation subtest, gains were in favor of the non-Saxon group. Black girls in the Saxon group achieved higher mean gains than black girls in the control group.

***Ach, Matl, Ethn, Gend* (Se)**

Rogness, Neal Thomas. (1994, July). The development and validation of a multi-factorial instrument to measure student attitudes toward a course in statistics (University of Northern Colorado, 1993). *DAI, 55B*, 231. [AAC 9413644]

A sample of (n=597) students completed a variety of written instruments. Results suggest that statistics course anxiety encompasses several components and individualized interventions are necessary. ***Assm, Stat, Anx, Att* (Ps)**

Ross, Rita Figura. (1994, May). The effects of personalized instruction on the division of fraction word problems (University of Denver, 1993). *DAI, 54A*, 4022. [AAC 9333366]

Fifth-grade students (n=82) worked on division-of-fractions word problems using Personalized Instruction strategies or not. Results indicated that success depends on school, class, and mathematics anxiety levels. ***TCHG, ACH, ANX, ATT, FRAC, M/D* (MS)**

Rossi, Michael Ann. (1994, March). The California Mathematics Project: Empowering elementary teachers to be leaders and change agents in mathematics reform (University of Oregon, 1993). *DAI, 54A*, 3314. [AAC 9405218]

Case studies of two elementary teacher-leaders in the California Mathematics Project show outcomes achieved by the teacher-leaders were improvements in their clients' teaching skills, commitment to reform of mathematics instruction, and sense of professionalism.
***ISRV, SOC* (EL)**

Rottier, Kathleen Louise. (1994, October). The relationship between goal orientation, self-efficacy and the use of procedural knowledge in problem-solving among high school freshmen (University of Maryland College Park, 1993). *DAI, 55A*, 898. [AAC 9425122]

Data from (n=57) freshmen on possession and use of procedural knowledge, intrinsic and extrinsic goal orientation, and self-efficacy showed that only prior knowledge was significantly correlated to the use of procedural knowledge. ***AFF, KNW* (HS)**

Sanders, Woodrow L. (1994, May). Impact of an integrated learning system on auditory, haptic, and visual learners (Baylor University, 1993). *DAI, 54A*, 3980. [AAC 9411541]

All of the fifth-grade groups that performed the best with an ILS as a supplement to traditional instruction were haptic groups. Three of the five groups that performed best with traditional instruction were visual learners; the other two were Hispanic learners.
***STYL, TCHG, ETHN* (MS)**

Schoeck, Anne McElligott. (1994, June). The effectiveness of cognitive/relaxation training in reducing test anxiety and math anxiety and improving arithmetic performance with ninth- and tenth-grade students (State University of New York at Albany, 1993). *DAI, 54A*, 4395. [AAC 9408882]

Inventory data from (n=80) students indicated that the cognitive/relaxation group reported significantly lower scores on the Emotionality scale of the Test Anxiety Inventory. There were no differences among groups on the math computation test. ***ANX, ARTH* (HS)**

Shields, Sharon Marie. (1994, January). To what degree does the methodology used to develop a mathematical concept predict students' mathematical success? (Texas A&M University, 1993). *DAI, 54A*, 2449. [AAC 9328803]

Comparing concept attainment instruction to traditional instruction with a sample of (n=203) middle school students, no statistically significant differences in achievement or attitude were found. ***TCHG, ACH, ATT* (MS)**

Shugar, Thomas L. (1994, September). Reform in a public school: The integration of heterogeneous instruction for reading and math (University of Pennsylvania, 1993). *DAI, 55A*, 438. [AAC 9420746]

This four-year study examined the change process as ability grouping for reading and math was eliminated, one grade at a time. The change was successful because of the active participation of the teachers and the slow, deliberate implementation. ***GRPG, ISRV* (EC)**

Simpson, Mary Lovenah. (1994, June). Let their eyes hear you: Teaching second-grade mathematics to hearing and hearing-impaired students using a student-centered approach (The University of Texas at Austin, 1993). *DAI, 54A*, 4383. [AAC 9413600]

The teacher used more visually oriented instruction and increased her direct communication with the hearing-impaired students. Manipulative materials facilitated understanding, and communication strategies encouraged exchange of ideas. ***DEAF, TCHG, MANP, ORAL* (EC)**

Skinner, Sara Brame. (1994, April). Conceptual instruction in developmental algebra and its effect on student achievement and affect (The University of North Carolina at Greensboro, 1993). *DAI, 54A*, 3695. [AAC 9406699]

Conceptual versus procedural instruction produced no significant differences in achievement or affect among (n=65) community college students. ***DEVM, TCHG, ACH, AFF* (Ps)**

Slettenhaar, Hendrik Karel. (1993, Winter). The design and evaluation of a computer-assisted curriculum for automating the adding and subtracting tables (Universiteit Twente, 1993). *DAI, 54C*, 968. [NOT AVAILABLE]

CAI software based on five-structures, developed in the Netherlands, was successful in helping most students master the basic addition and subtraction tables. ***CAI, SOFT, A/S* (EC)**

Smith, Constance Flahive. (1994, August). The process of change in two mathematics teachers: A naturalistic study (The University of Rochester, 1994). *DAI, 55A*, 236. [AAC 9417282]

This study was part of a larger research project concerned with the introduction of active reading strategies into mathematics instruction. The dimensions along which two teachers made changes were identified and their lived theories of learning were explored.

***ISRV* (K-12)**

Smith, Erick E. (1994, May). Practice in a radical constructivist setting: The role of virtues and activities in mathematical knowing (Cornell University, 1993). *DAI, 54A*, 4022. [AAC 9410505]

The goal initially was to understand the role of small group interactions and computers in the learning of mathematics, but developed into a search for ways to expand radical constructivist theory to allow social and individual perspectives to play complementary roles.

***LRNG, SOC, GRPG* (ALL)**

Smith, Maureen Ann. (1994, December). The influence of picture format and indefinite quantifiers on the ability of students with serious emotional disturbance to solve word problems (State University of New York at Buffalo, 1994). *DAI, 55A*, 1529. [AAC 9429862]

There were no significant differences in student (n=39) performance across test formats but there were between performance on items involving extraneous information and on those that did not. ***LANG, PERS, A/S, PS* (EL)**

Smyser, Eileen Marie. (1994, December). The effects of 'The Geometric Supposers': Spatial ability, van Hiele levels, and achievement (The Ohio State University, 1994). *DAI, 55A*, 1498. [AAC 9427802]

The Geometric Supposer group (n=16) gained as much or more than the control group (n=23) on measures of spatial visualization, van Hiele level, and achievement, but not significantly more. A correlation of .45 was found between van Hiele level and achievement.

***GEOM, SOFT, ACH, LRNG, VIS* (HS)**

Sneller, Lowell Lee. (1994, January). Training for understanding: A model for mediating abstract statistical concepts (Iowa State University, 1993). *DAI, 54A*, 2432. [AAC 9335024]

Two groups of students received CAI on statistical concepts based on a three-stage model for transferring attributes from concrete to abstract settings. The model training improved factual retention but did not improve performance on routine and novel problems.

***LRNG, STAT, CAI, PS* (Ps)**

Snyder, Vaughn. (1994, October). Effects of cooperative learning upon student ability to communicate mathematically: An ethnographic study (Ohio University, 1994). *DAI, 55A*, 856. [AAC 9424633]

A continuum emerged related to student understanding of concepts and their ability to communicate their understanding mathematically. Teachers need to listen carefully to understand answers that vary from standard vocabulary and textbook explanations.

***GRPG, ORAL, MANP, WRIT* (EL)**

Sosa, Carmen Pacheco. (1994, September). The effects of text format and content on English as a Second Language students' ability to solve math word problems (The University of Iowa, 1993). *DAI, 55A*, 492. [AAC 9421203]

Fifth-graders (647 white, 153 Hispanic) completed 18 multiple-choice word problems. Word length of the problems made no difference, but the presence of extraneous information significantly lowered scores, more for Hispanics than for whites. ***LANG, PS, ETHN* (MS)**

Sprague, Arlene Kay. (1994, September). An interview-based analysis of sixth graders' cognition of fractions in contexts of subdivision, comparison, and partitioning (The University of Tennessee, 1993). *DAI, 55A*, 515. [AAC 9421682]

Twelve sixth graders had developed a part-whole concept of fractions and one-half was a strong intuitive concept for all. Among the less proficient math students, a whole number interpretation of fraction symbols was common. ***FRAC, EQV* (MS)**

Stecker, Pamela Marie. (1994, July). Effects of instructional modifications with and without curriculum-based measurement on the mathematics achievement of students with mild disabilities (Vanderbilt University, 1993). *DAI, 55A*, 72. [AAC 9416516]

Teachers selected (n=42) pairs of students with learning disabilities for participation in the 20-week study. Results indicated that the CBM students performed better than their partners, whose instructional changes were not based on CBM data.

***ASSM, CURR, LD, ACH* (K-12)**

Strange, Charlotte Manning. (1994, March). Measurement of volume: Toward basing instruction on scientific knowledge (The University of Alabama, 1993). *DAI, 54B*, 4717. [AAC 9405300]

Individual interviews were conducted with (n=257) children, grades 2-5. In third grade, 72% showed transitivity and 61% showed unit iteration, implying that third grade is the appropriate grade level to begin teaching measurement of volume. ***CURR, MEAS, LRNG* (EL)**

Suggate, Jennifer. (1994, Winter). The use of visual images of computer programs for primary school mathematics (Open University, 1993). *DAI, 55C*, 1038. [NOT AVAILABLE]

Programs for instructing 6- to 8-year-olds on place value concepts were written for the Archimedes microcomputer. A third of the children had difficulty interpreting the number line. Mental methods of calculation ranged from counting to methods based on place value.

***PLCV, REP, SOFT, A/S* (EC)**

Sullivan, Michael James. (1994, February). Student production of interactive video in a junior high school (The University of Texas at Austin, 1993). *DAI, 54A*, 2996. [AAC 9401005]

Ninety seventh graders designed computer-assisted interactive video lessons on percent. Participants engaged in mathematical communications more frequently and exhibited increased metacognitve skills. Posttest scores on percent increased by 100%.

***PCT, TECH, MTCG, ORAL* (MS)**

Sun, Wei. (1994, July). A comparative analysis of the secondary mathematics curriculum in the People's Republic of China (Columbia University Teachers College, 1993). *DAI, 55A*, 59. [AAC 9414463]

Both the U.S. and China urge students to take math every year in secondary school and acknowledge that different math topics need to be treated differently. Math curricula in the two countries differ in content coverage and emphasis on pedagogy. ***CC, CURR* (SE)**

Tangretti, Linda Monzo. (1994, September). Assessment of content knowledge and pedagogical skills of elementary teachers in mathematics (University of Pittsburgh, 1993). *DAI, 55A*, 537. [AAC 9421508]

This study assessed the mathematical content knowledge and pedagogical skills of elementary teachers to determine if they are adequately prepared to teach mathematics based on NCTM recommendations. Findings indicate that the teachers are not adequately prepared to meet NCTM expectations. The current focus is an algorithmic approach with emphasis on numeration and computation. Lack of confidence in content areas beyond arithmetic contribute to the lack of preparedness of elementary teachers to implement innovative curricula.

***TKNW, TCHG, CURR* (EL)**

Taylor, Jill. (1994, August). Socially assisted learning and mathematical problem-solving (Hofstra University, 1994). *DAI, 55B*, 633. [AAC 9415682]

Fourth-grade students (n=36) participated in socially assisted learning, cooperative learning, or control conditions. Socially assisted learners scored highest on quizzes and could focus on problem structure, monitor performance, and assume leadership roles.

***PS, SOC, GRPG, KNW, MTCG* (EC)**

Thomas, Christine Darling. (1994, January). Constructivism and African-American students' confidence in mathematics (Georgia State University, 1993). *DAI, 54A*, 2499. [AAC 9335072]

A constructivist approach to teaching increased discourse among African-American high school students and encouraged them to engage in mathematical tasks. Ninety-seven percent reported feeling more confident about their mathematical ability working in small groups.

***AFF, ETHN, TCHG, GRPG, ORAL* (HS)**

Thompson, Denisse Rubilee. (1994, February). An evaluation of a new course in precalculus and discrete mathematics. (Volumes I and II) (The University of Chicago, 1992). *DAI, 54A*, 2934. [AAC 9400103]

This study evaluated the UCSMP Precalculus and Discrete Mathematics across nine schools. Students (n=141) scored substantially higher than SIMS students on SIMS items. Technology use varied widely. All teachers (n=9) would use the materials again.

***CALS, DSCM, MATL, GCAL, PRF* (HS)**

Todd, Thomas Lee. (1994, July). The effects of a computer management system upon the mathematical achievement of sixth-grade students (State University of New York at Buffalo, 1994). *DAI, 55A*, 44. [AAC 9414723]

The experimental group (n=150) had higher achievement scores in computations, concepts, and applications than the control group (n=150). Males had higher achievement scores, but females had higher achievement gains. Teachers' attitudes improved significantly.

***ACH, COMP, GEND, TATT* (MS)**

Tompkins, Lynda Sharron. (1994, March). Explaining variability of performance in undergraduate statistics (The University of Texas at Austin, 1993). *DAI, 54A*, 3346. [AAC 9401013]

Data collected from (n=180) students across two universities was used to identify significant variables. The most important cognitive variable was GPA and the most important affective variable was attitude toward statistics. **ACH, STAT, AFF (Ps)**

Tougaw, Paul William. (1994, February). A study of the effect of using an 'open approach' to teaching mathematics upon the mathematical problem-solving behaviors of secondary school students (Southern Illinois University at Carbondale, 1993). *DAI, 54A*, 2934. [AAC 9403120]

The open approach to teaching improved students' (n=50) mathematical problem-solving performance and attitudes towards mathematics significantly in a positive way. Gender did not have a significant effect on problem-solving performance. **PS,TCHG, ATT, GEND (HS)**

Tournaki, Helen. (1994, October). Comparison of two methods of teaching addition to learning disabled and regular education students (New York University, 1993). *DAI, 55A*, 933. [AAC 9423014]

Learning disabled (n=42) and regular students (n=42) were assigned to active interaction, drill and practice, or control conditions. Active interaction students scored highest and learning disabled students improved only in this condition. **LD, TCHG, A/S (EC)**

Trowell, Sandra Davis. (1994, September). The negotiation of social norms in a university mathematics problem solving class (The Florida State University, 1994). *DAI, 55A*, 500. [AAC 9422473]

Case studies of four students and the instructor revealed that negotiated norms included collaboration, intellectual autonomy, and students devising their own methods, determining the viability of their solutions, and initiating the presentation of multiple solutions and ideas.
PS, SOC (Ps)

Tunstall, Paul McKinley, Jr. (1994, February). The structure of knowledge for mathematics (Texas Tech University, 1993). *DAI, 54A*, 2916. [AAC 9404078]

Judgments of (n=80) mathematicians from around the world were used to validate the proposed model. Results indicated that the overall model and each of its three components was judged valid, comprehensive, and useful. **REP (ALL)**

Upshaw, Jane T. (1994, May). The effect of the calculator-based, graph-exploration method of instruction on Advanced Placement Calculus achievement (University of South Carolina, 1993). *DAI, 54A*, 4023. [AAC 9410056]

Nine classes each used the graph exploration approach on one of two units. For the first unit (the indefinite integral), traditionally taught classes did significantly better on graphical problems. For the second unit (Fundamental Theorem of Calculus), there was no difference.
CALS, GCAL, ACH (HS)

Vaughn, Dottie Hernandez. (1994, August). A study of the incorporation of journal writing structured upon Bloom's taxonomy within college algebra classes (The University of Southern Mississippi, 1993). *DAI, 55A*, 216. [AAC 9417848]

Seven of 14 classes participated in structured journal writing. Females achieved higher than males but exhibited a less positive attitude towards mathematics. When journal writing facilitated performance, males were helped more than females.
ACH, ATT, WRIT, ALG, GEND (Ps)

Vidakovic, Draga. (1994, March). Cooperative learning: Differences between group and individual processes of construction of the concept of inverse function (Purdue University, 1993). *DAI, 54A*, 3361. [AAC 9403803]

Based on observations of five individual students and five groups of students, it was concluded that there was a difference between the individual and group processes involved in learning the concept of inverse function. Computer activities to assist the processes were developed. ***GRPG, LRNG, CALS, SOFT* (PS)**

Vohra, Promod. (1994, February). An analysis of integration of technology in mathematics education at the Illinois Mathematics and Science Academy (Northern Illinois University, 1993). *DAI, 54A*, 2996. [AAC 9400671]

A theoretical model of technology-aided mathematics education was developed and used to evaluate the IMSA program. Issues include learning benefits, role of industry, crucial factors, future events, and methods of dissemination. ***CURR, TECH* (HS)**

Walen, Sharon B. (1994, February). An analysis of students' knowledge of the mathematics classroom (Washington State University, 1993). *DAI, 54A*, 2935. [AAC 9402927]

Beginning with an analysis of the questions students ask, this study focuses on conflicts that arise in the classroom, reasons for these conflicts, how students feel these conflicts, events that prompt the conflicts, and how students' ways of knowing are communicated.
***BLF, ORAL, SOC* (ALL)**

Wentworth, Nancy Gayle McMillan. (1994, January). A factor analysis of parent perceptions concerning the roles of education, mathematics, and teachers in the implementation of technology (The University of Utah, 1993). *DAI, 54A*, 2546. [AAC 9332578]

Parents in five elementary schools perceived similarities in the roles of education and mathematics in the implementation of technology. Unexpectedly, they also saw similarities in the roles of teachers and computers. ***TCHG, TECH, COMP, SOC* (EL)**

Werner, Judy A. (1994, January). Teacher beliefs about calculator use as part of instruction and on tests and factors that influence those beliefs (University of South Carolina, 1993). *DAI, 54A*, 2461. [AAC 9400296]

Survey responses from teachers (n=44), grades 5-7, show that past experience, professional organizations, textbooks and materials, the school district, and others' beliefs influence their own beliefs about calculator usage in the classroom and on tests. ***CALC, TBLF, SOC* (MS)**

Whang, Woo-Hyung. (1994, March). The impact on mathematics word problem solving by language facility (University of Georgia, 1993). *DAI, 54A*, 3361. [AAC 9404697]

Six Korean-English bilingual students used different techniques according to their stage of bilingualism to solve mathematical word problems written in English. Results seem to support Vygotsky's linguistic theory and the weak version of the Sapir-Whorf hypothesis.
***LANG, PS, ETHN, LRNG, WRIT* (ALL)**

White, David L. (1994, September). Revision in tasks of writing to learn in college mathematics: The case for instructional support (The University of Tennessee, 1993). *DAI, 55A*, 462. [AAC 9421696]

Two teachers assigned students three writings which were examined for length, syntactic maturity, and cognitive operations. Teachers thought the tasks helped students and gave the teachers more information about students' understanding of mathematics. ***WRIT, DEVM* (PS)**

Wilensky, Uriel Joseph. (1994, March). Connected mathematics: Building concrete relationships with mathematical knowledge (Massachusetts Institute of Technology, 1993). *DAI, 54A*, 3361. [NOT AVAILABLE]

To encourage a less formal, more intuitive and creative approach to mathematics, the "connected mathematics" approach encourages explicit connections between mathematical ideas and other pieces of knowledge both mathematical and non-mathematical.

***CURR, TECH, FRAC, PRF, PROB* (K-12)**

Wilford, Paul Ward. (1994, February). Peer collaboration in the mathematics teachers network project: A qualitative study (Utah State University, 1993). *DAI, 54A*, 2976. [AAC 9402317]

Schools with administrative support were most successful in implementing project activities. In-service activities by local teachers (n=10) promoted collaboration among teachers. Teacher concern for self-exposure was the major inhibitor. ***ISRV, SOC* (K-12)**

Williams, Janet D. (1994, July). Implementing the NCTM Standards for school mathematics: The effectiveness of site-based teacher inservice at Winter Haven High School, Florida (University of Central Florida, 1993). *DAI, 55A*, 59. [AAC 9414224]

Questionnaires, interviews, observations, and other data from (n=12) teachers suggested that the in-service was generally effective both in increasing the frequency of desired teaching techniques and in promoting positive attitudes about the NCTM Standards.

***ISRV, TCHG* (HS)**

Wilson, Linda Marie Dager. (1994, February). Assessment in a secondary mathematics classroom (The University of Wisconsin - Madison, 1993). *DAI, 54A*, 2935. [AAC 9322564]

Only tests, quizzes, and exams were graded and therefore valued. Discrepancies between beliefs and practice were attributed to others' expectations, the curriculum, the structure of the school, and working conditions. ***ASSM, ALG* (HS)**

Wimbish, Glenn Joseph, Jr. (1994, February). Identification and classification of attitudes of nonspecialist undergraduate mathematics students that might affect collegiate cooperative learning procedures (The University of Alabama, 1993). *DAI, 54A*, 2935. [AAC 9403320]

This study examined student attitudes toward mathematics, mathematics teaching, and the use of cooperative learning interventions in a liberal arts mathematics classroom. No results are indicated in the abstract. ***ATT, GRPG* (PS)**

Wolfe, Peggy Ann McDonald. (1994, April). The use of imagery to solve mathematical word problems by second-grade students (Oklahoma State University, 1993). *DAI, 54A*, 3674. [AAC 9407282]

Students (n=24) solved word problems based on a traditional folktale. The pictures they drew were analyzed for spatial sense and problem solving. Those most capable of generating images were also best at problem solving and used their images in the solution process.

***PS, REP* (EC)**

Wu, Der-Bang. (1994, November). A study of the use of the van Hiele model in the teaching of non-Euclidean geometry to prospective elementary school teachers in Taiwan, the Republic of China (University of Northern Colorado, 1994). *DAI, 55A*, 1215. [AAC 9427458]

The class taught using an approach based on the van Hiele learning model engaged in a higher level of geometric thinking and achieved significantly higher than the class taught by the lecture method. ***GEOM, TCHG, ACH, LRNG, PRSV* (EL)**

Yang, Jin-Tan David. (1994, February). A study of computer literacy for prospective secondary school mathematics teachers in Taiwan (University of Oregon, 1993). *DAI, 54A*, 2878. [AAC 9402065]

Suggestions from mathematics educators and teachers were used to develop objectives to be mastered in becoming computer literate. The operational definition of computer literacy put strong emphasis on integrating the computer into instruction. ***COMP, CII, TCHG* (SE)**

Yoon, Gwan-Sik. (1994, May). The effects of instructional control, cognitive style, and prior knowledge on learning of selected CBI-taught arithmetic skills in a Korean elementary school (The Florida State University, 1993). *DAI, 54A*, 4069. [AAC 9410171]

Results on (n=166) second and third graders in Korea show that instructional control strategies interact with levels of prior knowledge and types of cognitive styles in their effect on mastery of multiplication facts. ***M/D, CAI, KNW, STYL* (EC)**

Zaidi, Hilda Ann. (1994, October). Comparing cooperative learning variations and traditional instruction in seventh-grade mathematics: Effects on achievement and self-regulation strategies (Columbia University Teachers College, 1994). *DAI, 55A*, 858. [AAC 9424546]

Six intact classes of two teachers were randomly assigned to traditional instruction, student team learning, and enhanced cooperative learning. Teacher effects were significant, and for one teacher on the third test, cooperative methods were superior to traditional instruction. ***GRPG, ACH, MTCG* (MS)**

Zubris, John M. (1994, December). The effects of summarization tools and look-back ability on look-back performance (The Pennsylvania State University, 1994). *DAI, 55A*, 1499. [AAC 9428239]

Seventh-grade students (n=129) who ranked high or low on looking-back ability were assigned to summary, completion, or control treatments. Statistically significant results showed that summaries and completions teach problem solvers of different abilities to look back. ***PS, TCHG, KNW* (MS)**

Dissertations by Institution

United States

American U.
Lee, R.E.
Andrews U.
Cox
Arizona State
Diaz S.; Kim, Y.S.
Auburn U.
Carter, J.P.W.; Lee, D.B.; Parnell
Baylor U.
Isbell; Leiker; Sanders
Boston College
Halpern; Moynihan
Brigham Young
Arnoldsen
Cath. U. of America
Blagmon-Earl
City U. of N. Y.
Moore, P.J.
Clark U.
Costa
Columbia U.
Akins; Burns; Klig; Mwerinde; Nayer; Newsome; Sun; O'Connell; Zaidi
Cornell U.
Smith, E.E.; Piliero
Drake U.
Chen; McKernan
Florida State
Diaz O.; Follett; McGlamery; Olson; Trowell; Yoon
Gallaudet U.
Glover
Georgia State
Johnson, W.R.; Nash; O'Neal; Ottinger; Poppe; Thomas
Hofstra U.
Taylor
Indiana U.
Emenaker; Mau; Raymond
Iowa State
Pierson; Sneller
Kent State
Caniglia; Mikusa
Lamar U.
Covell
Louisiana State
Awtry; Reeves
M. I. T.
Carter, R.C.; Wilensky
Memphis State
Bassa; Harris; Lindberg; Liu
Miami U. (Ohio)
Latson
Michigan State
Rickard
Montana State
Dapples; Fredenberg
New York U.
Frant; Tournaki
N. C. State
Capps
Northern Arizona
Henry, R.J.
Northern Illinois
Vohra
Nova U.
Bartlett
Ohio State
Chien; Drevno; Drury; Edwards; Hoosain; Kunicki; Kwak; Mathews; Smyser
Ohio U.
Chakalisa; Nhlengetfwa; Snyder
Oklahoma State
Hall; Wolfe
Oregon State
Chalardkid
Penn. State
Zubris
Purdue U.
Perlwitz; Vidakovic
Rutgers–N. Brunswick
Cerreto
S. Ill.–Carbondale
Meeks; Tougaw
Stanford U.
Hackett
SUNY Albany
Schoeck
SUNY Buffalo
Gonzalez G.; Hsu; Smith, M.A.; Todd
Syracuse U.
Mukunda
Temple U.
Peterson
Texas A&M
Allen; Majdalani; Mittag; Shields
Texas Tech
Tunstall
Texas Woman's
Bearden; Higginbotham
Union Institute
Lai
U. of Akron
Dipillo
U. of Alabama
Clark, F.B. Dobbins; Massey; Strange; Wimbish
U. of Arkansas
Caselman
U. of Central Florida
Williams
U. of Chicago
Thompson
U. of Cincinnati
Dinkheller; Grogan
U. of Connecticut
Dean
U. of Denver
Ross
U. of Georgia
Bennett, E.M.; Dresden; Estes; Hsieh; Jiang; Whang
U. of Houston
Bennett, J.M.R.; King
U. of Ill.–Chicago
Caftori

U. of Iowa
Sosa; Jenkins
U. of La Verne
Clarke
U. of Lowell
Loynd
U. of Md.–Coll. Pk.
Hight; Langrall; Lee, S.W.; Parham; Rottier
U. of Mass.
Arriola
U. of Miami
Oropesa
U. of Michigan
Burkam; Burks
U. of Minnesota
Ellison
U. of Mo.–Columbia
Bolte; Floyd; Morton; Reehm
U. of Mo.–K. C.
Kincheloe
U. of Nevada–L. V.
Quinn
U. of N. H.
LeBlanc
UNC–Greensboro
Bowman; Kasparek; Skinner
U. of North Texas
Clay; McAdoo; Millican
U. of N. Colorado
Bloome; Duchrow; Ma; Rogness; Wu
U. of N. Iowa
Busta
U. of Oklahoma
Barker; Easley; Nichols
U. of Oregon
Baker; Faurot; Johnson, J.M.; Kim, S.Y.; Rossi; Yang
U. of Penn.
Rasimas; Shugar
U. of Pittsburgh
Fan, D.H.; Gabriele; Tangretti
U. of Rochester
Smith, C.F.
U. of S. Carolina
Bull; Gordon; Keim; Onwuegbuzie; Upshaw; Werner
U. of S. Dakota
Mudge; Ostler
U. of S. Florida
Greico
U. of S. California
Ayala; Kosmicki; Lanich
U. of S. Mississippi
Brodney; Lee, M.J.; Luce; Roberts; Vaughn
U. of Tennessee
Sprague; White
U. of Texas–Aus.
Almstrum; Foutz; Gerhard; Gibbs; Gittinger; Owen; Johnson, L.F.; Paredes; Simpson; Sullivan; Tompkins
U. of Utah
Wentworth
U. of Virginia
Dorgan; Maxwell; Moore, S.D.; Perie
U. of Wisc.–Madison
Behrend; Gutstein; Hartig; Hopp; Martin; Richgels; Wilson
U. of Wyoming
Bershinsky
Utah State
Hu; Wilford
Vanderbilt U.
Klein; Stecker
Wash. State
Parsons; Walen
Wayne State
McMann
West Virginia
Gillespie; Henry, M.J.
W. Michigan
Keller

CANADA

Concordia U.
Reid
Queen's–Kingston
Harrison
Simon Fraser
Cichos
U. of B. C.
Gooya; Menon
U. of Calgary
Fan, N.
U. of Ottawa
Gurney
U. of Saskatchewan
Madden
U. of Toronto
Ayano; Clark, J.L.; Fullerton; Haimes; Lato
York U.
Artuso

ELSEWHERE

Open U.
Suggate
Queen's–Belfast
Mallon
U. de la Laguna
Bethencourt B.
U. Twente
Slettenhaar
U. of N. S. W.
Kaldor; Phalavonk
U. of Southampton
Hariki
U. of Sussex
Dallaway

RESEARCH ARTICLES PUBLISHED IN 1994

GALE A. WATSON, *Ohio State University*
MICHELLE K. REED, *Ohio State University*

This section lists 185 articles in mathematics education research that were published during 1994. Each entry is coded (see Key to Codes) with 1-3 ***MAJOR*** and any number of ***MINOR*** topic codes, as well as the grade **LEVEL** (in parentheses). All entries are indexed by ***MAJOR*** codes at the end of this volume. Please note that studies related to preservice or inservice teacher education are so indicated by the appropriate topic codes (*PSRV*, *ISRV*). The **LEVEL** designated on teacher education studies refers to the grade level(s) at which the intern or teacher participants teach. A list of the journals searched and the number of articles included from each is provided at the end of this section.

Antonietti, Alessandro; Cerana, Paola; Scafidi, Laura. (1994, February). Mental visualization before and after problem presentation: A comparison. *Perceptual and Motor Skills*, *78*, 179-189.

Subjects generated mental images before and after a problem was presented. Analysis showed that "imagery-after" helped overcome misleading or fixating tendencies that interfere with solutions; "imagery-before" enhance such tendencies. ***PS***, ***VIS***, ***ARTH***, ***GEOM*** (**HS**, **Ps**)

Armstrong, Gerald; and others. (1994, December). Our experience with two reformed calculus programs. *PRIMUS*, *4*(4), 301-311.

Gives a general description of reformed calculus efforts and describes experiences with two reformed calculus programs in contrast to traditional calculus. Compares these three programs using teaching evaluations and student journals. ***CALS***, ***TCHG***, ***CII***, ***CURR*** (**Ps**)

Barber, Fredrick; Narayan, Jack. (1994, December). Technology, cooperative learning, and assessment in the teaching of ordinary differential equations. *PRIMUS*, *4*(4), 337-346.

Reports on the use of technology to enhance the teaching of ordinary differential equations, gives examples of laboratory activities using cooperative learning, and discusses assessment of student learning. MacMath, TI-81 graphing calculators, and Maple were used in the course. ***ADVM***, ***CII***, ***GCAL***, ***GRPG*** (**Ps**)

Bart, William M.; and others. (1994, Summer). A diagnostic analysis of a proportional reasoning test item: An introduction to the properties of a semi-dense item. *Focus on Learning Problems in Mathematics*, *16*(3), 1-11.

Discusses the use of multiple-choice test items to diagnose student misunderstandings. Properties of semi-dense items are discussed and illustrated with an example and by using a refined item digraph. ***ASSM***, ***D/R***, ***EQV*** (**K-12**)

Batanero, M. C.; and others. (1994, January). The training of researchers in mathematics education: Results from an international survey. *Educational Studies in Mathematics*, *26*(1), 95-102.

Describes the results of an international survey of (n=94) graduate programs that collected data about the training of researchers in mathematics education and established an information network about graduate programs in mathematics education. ***ISRV***, ***RSCH*** (**Ps**)

Battista, Michael T. (1994a, January). On Greeno's environmental/model view of conceptual domains: A spatial/geometric perspective. *Journal for Research in Mathematics Education, 25*(1), 86-99.

Discusses the spatial aspects of Greeno's model of conceptual domains and applies the theory to the learning of geometry. Examines the relationship between mathematical and spatial thinking in light of Greeno's environmental/spatial view of learning. **GEOM, REP, VIS (K-12)**

Battista, Michael T. (1994b, March). Research into practice: Calculators and computers: Tools for mathematical exploration and empowerment. *Arithmetic Teacher, 41*(7), 412-417.

Discusses ways that calculators and computer microworlds, such as Logo and Shape Makers, can be used as tools for exploration, problem solving, and empowerment in school mathematics. Includes suggestions for classroom activities. **CALC, COMP, IMPL (EL)**

Battista, Michael T.; Larson, Carol Novillis. (1994, November). The role of JRME in advancing learning and teaching elementary school mathematics. *Teaching Children Mathematics, 1*(3), 178-182.

Focuses on the contribution of the Journal for Research in Mathematics Education to the view of learning and teaching elementary school mathematics embodied in current curricular recommendations for school mathematics. **IMPL, RSCH, CURR, LRNG, TCHG (EL)**

Berg, Craig, A.; Phillips, Darrell G. (1994, April). An investigation of the relationship between logical thinking structures and the ability to construct and interpret line graphs. *Journal of Research in Science Teaching, 31*(4), 323-344.

Responses to Piagetian tasks revealed that a significant correlation exists between logical thinking structures and the ability to construct and interpret line graphs.

LRNG, REP, ALG (K-12)

Berg, Craig A.; Smith, Philip. (1994, November). Assessing students' abilities to construct and interpret line graphs: Disparities between multiple-choice and free-response instruments. *Science Education, 78*(6), 527-554.

Examines the instrumentation used to assess both graphing abilities and the impact of microcomputer-based laboratories (MBL) on students' graphing abilities. Numerous disparities exist between the results of multiple-choice and free response instruments.

ASSM, REP, ALG, COMP (HS)

Berlin, Donna F.; Hillen, Judith A. (1994, October). Making connections in math and science: Identifying student outcomes. *School Science and Mathematics, 94*(6), 283-290.

Identified 423 cognitive student outcomes as perceived by (n=45) classroom teachers to be related to participation in a hands-on, integrated mathematics/science program called AIMS. Involvement in the research project contributed to teachers' professionalism.

IC, ISRV, LRNG (EL)

Bernardo, Allan B. I.; Okagaki, Lynn. (1994, June). Roles of symbolic knowledge and problem-information context in solving word problems. *Journal of Educational Psychology, 86*(2), 212-220.

College students were more likely to construct correct equations when symbolic knowledge was presented than when they only received a single relational statement (students/professors problem). Contextual constraints in problem solving are discussed. **LANG, PS, REP (PS)**

Bishop, Alan J. (1994, June). Cultural conflicts in mathematics education: Developing a research agenda. *For the Learning of Mathematics, 14*(2), 15-18.

Discusses research issues deriving from different interpretations and responses to cultural conflicts in mathematics education and presents a possible research agenda.

***ETHN, IMPL, RSCH* (K-12)**

Bitter, Gary G.; Hatfield, Mary M. (1994, June). Training elementary mathematics teachers using interactive multimedia. *Educational Studies in Mathematics*, *26*(4), 405-409.

Two studies indicate that preservice teachers were more likely to incorporate into their teaching repertoire knowledge they acquired from an interactive multimedia system than from conventional methods. ***PRSV, TECH, TKNW, TCHG* (EL)**

Borasi, Raffaella. (1994, March). Capitalizing on errors as "springboards for inquiry": A teaching experiment. *Journal for Research in Mathematics Education*, *25*(2), 166-208.

Reports a case study exploring how two 16-year-olds were enabled to capitalize on the potential of errors to stimulate and support mathematical inquiry. Discusses variations within the strategy of using errors to enhance mathematics instruction. ***D/R, TCHG* (HS)**

Borget, Michele M.; Filroy, Faith D. (1994, October). Interests and self-efficacy as predictors of mathematics/science-based career choice. *Psychological Reports*, *75*, 753-754.

This study examined the relationship of (n=125) college women's mathematical self-efficacy and interest in mathematics/science-based careers to the consideration of pursuing such careers. Interest alone was a significant predictor of career choice. ***AFF, GEND* (PS)**

Boulter, Douglas R.; Kirby, John R. (1994, May-June). Identification of strategies used in solving transformational geometry problems. *Journal of Educational Research*, *87*(5), 298-303.

Ten students from grades 7 and 8 solved five transformational geometry problems. Results indicated that some students showed a preference for holistic versus analytic processing and that use of analytic strategies was associated with success. ***GEOM, PS, STYL* (MS)**

Boulton-Lewis, Gillian M.; Tait, Kathleen. (1994, June). Young children's representations and strategies for addition. *British Journal of Educational Psychology*, *64*(2), 231-242.

A sample of (n=55) children in years 1, 2, and 3 in three schools in Brisbane showed a developmental sequence from use of objects, to use of counting, to mental calculations using knowledge of number facts and place value. ***A/S, REP, PLCV* (EC)**

Bromme, Rainer; Steinbring, Heinz. (1994, October). Interactive development of subject matter in the mathematics classroom. *Educational Studies in Mathematics*, *27*(3), 217-248.

Two lessons introducing probability taught by an expert and a non-expert 6th-grade teacher were analyzed for the quality of teaching. The expert teacher more consistently explicated the relationship between formal symbols and the given mathematical tasks.

***TCHG, TCHR, PROB* (MS)**

Buschman, Larry. (1994, March). Sometimes less is more. *Arithmetic Teacher*, *41*(7), 378-380.

An action research study of second-grade students' group work indicates that when students were not given sample solutions for problems, they were more likely to use higher order thinking, take ownership of strategies, discuss solutions longer, and be more accepting of other views. ***ORAL, PS, TCHG* (EC)**

Cai, Jinfa. (1994, December). A protocol-analytic study of metacognition in mathematical problem solving. *Mathematics Education Research Journal*, *6*(2), 166-183.

Metacognitive behaviors of subjects having high (n=2) and low (n=2) levels of experience were compared across four cognitive processes: orientation, organization, execution, and verification. High-experience subjects engaged in self-regulation and spent more time on orientation and organization. ***MTCG, PS, STYL* (PS)**

Callahan, Walter. (1994, February). Implementing the *Professional Standards for Teaching Mathematics:* Teaching middle school students with diverse cultural backgrounds. *Mathematics Teacher*, *87*(2), 122-126.

Shares information on selected characteristics of Hispanic and Haitian students that may affect their mathematical learning and gives examples of classroom strategies that may be helpful in working with these students. ***ETHN, IMPL*** **(MS)**

Callejo, Maria Luz. (1994, July). Les representations graphiques dans la resolution de problemes: Une experience d'entrainement d'etudiants dans un club mathematique (Graphic representations in problem solving: A training program for students [in] a mathematical club.). *Educational Studies in Mathematics*, *27*(1), 1-33.

Reports, in French, an investigation of graphic representations in problem-solving tasks of the type in Spanish Mathematical Olympiads. The choice and interpretation of the first graphic representation played a decisive role in the discovery of the solution.

PS, REP, ALG **(SE, PS)**

Carroll, Jean. (1994, December). What makes a person mathsphobic? a case study investigating affective, cognitive and social aspects of a trainee teacher's mathematical understanding and thinking. *Mathematics Education Research Journal*, *6*(2), 131-143.

Presents a case study of the interaction of cognitive and affective factors in one early childhood teacher education student's experiences of learning mathematics. Identifies issues of concern to both preservice teachers and teacher educators. ***AFF, LRNG, SOC, PRSV*** **(EC)**

Carroll, William M. (1994, September). Using worked examples as an instructional support in the algebra classroom. *Journal of Educational Psychology*, *86*(3), 360-367.

High school students who studied worked examples while learning how to translate English expressions into algebraic equations outperformed the control group, made fewer errors and fewer types of errors, completed work more rapidly, and required less teacher assistance.

ALG, REP, D/R **(HS)**

Chandler, Donald G.; Brosnan, Patricia A. (1994a, February). What is missed when teachers do not finish their mathematics textbooks? *Ohio Journal of School Mathematics*, (28), 25-32.

Presents data from a content analysis of mathematics textbooks for grades 1-8 showing that content areas were not evenly distributed throughout the texts and cautions that following a text in sequential order may cause students to miss important material. ***CURR, MATL*** **(EL)**

Chandler, Donald G.; Brosnan, Patricia A. (1994b, Fall). Mathematics textbook changes from before to after 1989. *Focus on Learning Problems in Mathematics*, *16*(4), 1-9.

Content analysis of seven text series, grades 1-8, found that textbooks published after 1989 showed shifts of emphasis among content areas; changes in amount of content development, drill, word problems, and problem solving; and increased use of estimation and calculators.

CURR, MATL **(EL)**

Clements, Douglas H.; Battista, Michael T. (1994). Computer environments for learning geometry. *Journal of Educational Computing Research*, *10*(2), 173-197.

Reviews research related to computer functions that noncomputer media cannot easily duplicate in construction-oriented environments and evaluates their unique contributions to students' learning of geometry. Implications for software design are drawn.

GEOM, REVW, SOFT **(K-12)**

Clements, M. A.; Lean, G. A. (1994, July). "Continuous" fraction concepts and cognitive structure. *Mathematics Education Research Journal*, *6*(1), 70-78.

Investigated the continuous fraction concepts of (n=59) students, grades 4-6. Students were confident and accurate when performing sharing tasks, but were much less successful on continuous quantity tasks involving formal fraction language and symbol manipulation.

***FRAC, LRNG* (EL)**

Cooney, Thomas J. (1994, December). Research and teacher education: In search of common ground. *Journal for Research in Mathematics Education, 25*(6), 608-636.

Discusses how issues related to mathematics teacher education are currently being addressed, what historical precepts have contributed to the present state of affairs, and what orientations can move teacher education forward as a legitimate field of disciplined inquiry.

***ISRV, PRSV, RSCH* (K-12)**

Cope, Peter; Simmons, Malcolm. (1994, September). Some effects of limited feedback on performance and problem-solving strategy in a Logo microworld. *Journal of Educational Psychology, 86*(3), 368-379.

Children who reproduced given rotations without the information provided by a rotating turtle used fewer trial-and-error problem-solving strategies and more higher level problem-solving strategies to compensate for lack of immediate feedback. ***GEOM, PS, SOFT* (EL)**

Cumming, J. Joy; and others. (1994, Fall). Are any errors careless? *Focus on Learning Problems in Mathematics, 16*(4), 21-30.

Tests of (n=107) 3rd- through 6th-graders' basic addition facts found that 34% of errors involved the addition of zero and 83% of the remaining errors involved at least one of the digits 7, 8, or 9 when the other addend was 4 or more. ***A/S, D/R* (EL)**

D'Ambrosio, Ubiratan; D'Ambrosio, Beatriz. (1994, December). An international perspective on research through the JRME. *Journal for Research in Mathematics Education, 25*(6), 685-696.

Discusses the universality of mathematics and mathematics education, Western mathematics, social and educational change, mathematics education research, and the role of the Journal for Research in Mathematics Education. ***CC, RSCH, SOC* (ALL)**

Davis, Robert B. (1994, March). What mathematics should students learn? *The Journal of Mathematical Behavior, 13*(1), 3-33.

Discusses needed improvements in teaching mathematics, considering students, human development, knowledge and learning, structure of schools and instructional programs, and mathematics. Also discusses the need for theories. ***IMPL, TCHG, CURR, LRNG* (K-12)**

De Block-Docq, Christine. (1994, September). Modalites de la pensee mathematique d'eleves de douze ans devant des problemes de pavages (Forms of mathematical thought of twelve-year-old students at tiling problems). *Educational Studies in Mathematics, 27*(2), 165-89.

Activities of 12-year-old students solving problems of polygonal tilings suggests two categories of thinking processes: instantaneous perceptions of simple structures and discursive thinking reflected in drawing activities and arguments of proofs. ***GEOM, LRNG, PS, PRF* (MS)**

Dorgan, Karen. (1994, November). What textbooks offer for instruction in fraction concepts. *Teaching Children Mathematics, 1*(3), 150-155.

Analyzes three textbook series for meaningful learning experiences with fractions relative to modes of representation, pictorial models, qualitative reasoning, and students' informal knowledge of partitioning. ***CURR, FRAC, IMPL, REP* (EC)**

Dubinsky, Ed; and others. (1994, October). On learning fundamental concepts of group theory. *Educational Studies in Mathematics, 27*(3), 267-305.

Describes observations, written samples, and interviews of (n=24) high school teachers learning concepts of group, subgroup, coset, normality, and quotient group in an abstract algebra course. Considers the role of errors from an action-process-schema perspective.

ADVM, LRNG, ISRV, TKNW (PS)

Dugdale, Sharon. (1994). K-12 teachers' use of a spreadsheet for mathematical modeling and problem solving. *Journal of Computers in Mathematics and Science Teaching, 13*(1), 43-68.

Reports a project that involved experienced K-12 teachers in mathematical modeling, using variables and functions in an intuitive context, while investigating the appropriateness of spreadsheet solution methods across a broad range of grade levels. *REP, SOFT, ISRV, PS* (K-12)

Dunham, Penelope H.; Dick, Thomas P. (1994, September). Connecting research to teaching: Research on graphing calculators. *Mathematics Teacher, 87*(6), 440-445.

Discusses results of research on graphing calculators in the following categories: (1) achievement studies, (2) conceptual understanding, (3) problem solving, (4) classroom dynamics, and (5) future research needed. *GCAL, IMPL, ACH, LRNG, ORAL, PS* (SE, PS)

Esty, Warren W.; Teppo, Anne R. (1994, Winter). A general-education course emphasizing mathematical language and reasoning. *Focus on Learning Problems in Mathematics, 16*(1), 13-35.

Describes a course intended to develop students' abilities to read mathematics, express mathematical thoughts clearly, reason logically, and grasp the nature of proof. Students improved their algebraic procedural skills and attitudes towards mathematics.

LANG, PS, ATT, PRF (PS)

Falk, Ruma. (1994, February). Infinity: A cognitive challenge. *Theory and Psychology, 4*(1), 35-60.

This article reviews the research on the development of children's understanding of the endlessness of numbers and of the infinite gap between a large finite set and an infinite set.

NSNS, REVW (EL)

Fan, Ning; Mueller, John H.; Marini, Anthony E. (1994). Solving difference problems: Wording primes coordination. *Cognition and Instruction, 12*(4), 355-369.

The focus of this study was the effect of wording on solving three types of difference problems by first graders. COMPARE problems were significantly harder than EQUALIZE and WON'T GET problems. *A/S, LANG* (EC)

Fennema, Elizabeth; Hart, Laurie E. (1994, December). Gender and the JRME. *Journal for Research in Mathematics Education, 25*(6), 648-659.

Addresses two questions: (1) How has gender and mathematics been treated in the JRME, and how does that record fit into the broader societal concern with gender and mathematics? (2) What kinds of studies should be published in the future to achieve equitable treatment?

GEND, RSCH, SOC (ALL)

Fernandez, Maria L.; and others. (1994, March). Connecting research to teaching: Problem solving: Managing it all. *Mathematics Teacher, 87*(3), 195-199.

Discusses research on helping students develop their mental managerial processes or metacognition, the role of a framework for problem-solving activities, the teacher as model or moderator, problem solving in small groups, and weaving writing into problem solving.

IMPL, PS, GRPG, MTCG, WRIT (SE)

Ferrini-Mundy, Joan; Johnson, Loren. (1994, March). Implementing the Curriculum and Evaluation Standards: Recognizing and Recording Reform in Mathematics: New questions, many answers. *Mathematics Teacher, 87*(3), 190-193.

The Recognizing and Recording Reform in Mathematics Education Project monitors the implementation of the NCTM Standards as well as a broader program of research and development. Discusses key issues in mathematics reform and describes the methodology of the project.
***LSAs, CURR, ISRV, TCHG* (K-12)**

Ferrini-Mundy, Joan; Lauten, Darien. (1994, February). Connecting research to teaching: Learning about calculus learning. *Mathematics Teacher*, *87*(2), 115-121.

Discusses research findings related to students' ability to make connections between analytical (symbolic) and graphical representations of functions in calculus. Describes graphing tasks and typical student interpretations. Implications for teaching are suggested.
***CALS, IMPL, GCAL, REP* (SE, PS)**

Fine, Anne E.; Fleener, M. Jayne. (1994). Calculators as instructional tools: Perceptions of three preservice teachers. *Journal of Computers in Mathematics and Science Teaching*, *13*(1), 83-100.

This study examines the perceptions of three preservice teachers regarding the use of calculators as instructional tools and the influence of personal, background, and social factors affecting the use of calculators in the classroom. ***CALC, PRSV, SOC, TCHR* (K-12)**

Flanders, James R. (1994, May). Textbooks, teachers, and the SIMS test. *Journal for Research in Mathematics Education*, *25*(3), 260-278.

Studied relationships between intended, implemented, and tested curricula of (n=84) classes of eighth-grade mathematics students based on SIMS data. The SIMS test for eighth graders was not representative of curriculum as defined by students' texts. ***CURR, LSAs* (MS)**

Fontana, David; Fernandes, Margarida. (1994, November). Improvements in mathematics performance as a consequence of self-assessment in Portuguese primary school pupils. *British Journal of Educational Psychology*, *64*, 407-417.

Results showed that children (n=354) in self-assessment classes showed significant improvement in scores on a purpose-built mathematics test over children (n=313) in a control group.
***ACH, ASSM* (EL)**

Ford, Margaret I. (1994, October). Teachers' beliefs about mathematical problem solving in the elementary school. *School Science and Mathematics*, *94*(6), 314-322.

Studied fifth-grade (n=10) teachers' and (n=20) students' beliefs about mathematical problem solving, attributions for levels of performance, and beliefs about the teaching and learning of problem solving. Gives four general conclusions. ***BLF, PS, TBLF* (MS)**

Fortuny, Joseph M.; and others. (1994, December). Integrated assessment on mathematics 12-16. *Educational Studies in Mathematics*, *27*(4), 401-412.

Integrated assessment (Work projects, Progress activities, Self-regulating elements, and Observation) showed (n=4) teachers focused on local aims; general aims; and intentions, attitudes, and confidence as evidence of improved classroom environment.
***ASSM, SOC, AFF* (HS)**

Frydman, Olivier; Bryant, Peter. (1994, December). Children's understanding of multiplicative relationships in the construction of quantitative equivalence. *Journal of Experimental Child Psychology*, *58*, 489-509.

Young children (5 & 6 yrs.) were asked to give different recipients the same total number of blocks, but the blocks were to be dealt out in different quantities to each recipient. The children did better when the total quantity was a multiple of the dealt number. ***EQV, M/D* (EC)**

Gallagher, Ann M.; De Lisi, Richard. (1994, June). Gender differences in Scholastic Aptitude Test—Mathematics problem solving among high-ability students. *Journal of Educational Psychology, 86*(2), 204-211.

Structured interviews with high school students who scored at least 670 on the SAT-M showed female students were more likely than male students to use conventional solution strategies, which may explain why females outperform males on conventional problems.

***GEND, LSAs, PS, ACH* (HS)**

Ganter, Susan L. (1994, Spring). The importance of empirical evaluations of mathematics programs: A case from the calculus reform movement. *Focus on Learning Problems in Mathematics, 16*(2), 1-19.

The Professional Development Program, in which (n=80) mostly minority precalculus students attend workshops featuring small study groups, faculty leadership, challenging mathematical materials, and peer support networks, showed no overall effect on student performance.

***CALS, ETHN, TCHG, GRPG* (PS)**

Garfield, Joan; Ahlgren, Andrew. (1994, February). Student reactions to learning about probability and statistics: Evaluating the Quantitative Literacy Project. *School Science and Mathematics, 94*(2), 89-95.

A survey of (n=917) students of teachers trained in the Quantitative Literacy Project workshops found that students have mostly positive attitudes towards learning statistics, but fewer students felt it was useful to learn these topics.

***ATT, STAT, ISRV* (K-12)**

Gerdes, Paulus. (1994, June). Reflections on ethnomathematics. *For the Learning of Mathematics, 14*(2), 19-22.

Discusses the ethnomathematics movement, concepts related to ethnomathematics, ethnomathematics as a field of research that studies mathematics in its relationship to cultural and social life, and the beginning of ethnomathematical research in Mozambique.

***ETHN, RSCH, SOC* (ALL)**

Gholam, Ghada Khoury. (1994, September). Children's strategies in measurement. *Mathematics In School, 23*(4), 43-46.

Discusses some results of the CSMS test which provides information for teachers on students' levels of understanding in secondary school mathematics, including comparison with a Piagetian task, identification of misconceptions, and description of naive strategies.

***LRNG, LSAs, MEAS* (SE)**

Goos, Merrilyn. (1994, December). Metacognitive decision making and social interactions during paired problem solving. *Mathematics Education Research Journal, 6*(2), 144-165.

Analysis of think-aloud paired problem-solving protocols showed that although two year-11 students were successful in coordinating different, yet complementary roles, their metacognitive decision making was adversely affected by social interaction.

***MTCG, PS, SOC, GRPG* (HS)**

Gravemeijer, Koeno. (1994, November). Educational development and developmental research in mathematics education. *Journal for Research in Mathematics Education, 25*(5), 443-471.

Presents an alternative to the research-development-diffusion model of mathematics education based on an integration of curriculum research and design embedded in educational development. Discusses characteristics and methods of developmental research.

***CURR, RSCH* (K-12)**

Gray, Eddie M.; Tall, David O. (1994, March). Duality, ambiguity, and flexibility: A "proceptual" view of simple arithmetic. *Journal for Research in Mathematics Education*, *25*(2), 116-140.

Discusses duality between process and concept in mathematics, ambiguity of symbolic notation, flexibility in thought processes of successful students, and a qualitatively different kind of arithmetical thought in more able compared to less able elementary students

***ARTH, LRNG* (EL)**

Grouws, Douglas A. (1994, September). Implementing the Professional Standards for Teaching Mathematics: The evaluation of teaching: Challenge and opportunity. *Mathematics Teacher*, *87*(6), 446-448.

Discusses four criteria essential for the development and use of appropriate systems for evaluating mathematics teaching: (1) make mathematics a priority, (2) consider teachers' beliefs, (3) use multiple data sources, and (4) make effective use of time.

***ASSM, TCHG, TATT, TBLF* (SE)**

Harel, Guershon; and others. (1994, July). Invariance of ratio: The case of children's anticipatory scheme for constancy of taste. *Journal for Research in Mathematics Education*, *25*(4), 324-345.

Studied invariance of ratio through (n=16) sixth graders' taste constancy. Results showed an absence of taste constancy and that children based their judgment of the relative strength of two samples from the same mixture on extraneous variables. ***EQV, FRAC* (MS)**

Harris, Sue. (1994, November). The Third International Mathematics and Science Study (TIMSS). *Mathematics In School*, *23*(5), 34-35.

Discusses the Third International Mathematics and Science Study including involvement of schools, international dimensions, content of tests, and value of TIMSS. ***LSAS* (K-12)**

Hatfield, Mary M. (1994, October). Use of manipulative devices: Elementary school cooperating teachers self-report. *School Science and Mathematics*, *94*(6), 303-309.

Studied (n=87) elementary cooperating teachers' self-reported familiarity with, access to, and use of 11 common manipulative devices. Found limited use of manipulatives and a pattern of diminishing use through the grades. ***MANP, TCHG, ATT* (EL)**

Herscovics, Nicolas; Linchevski, Liora. (1994, July). A cognitive gap between arithmetic and algebra. *Educational Studies in Mathematics*, *27*(1), 59-78.

Investigated (n=22) seventh-grade students' informal processes in solving first degree equations in one unknown prior to instruction. Results indicated a cognitive gap characterized as the students' inability to operate spontaneously with or on the unknown.

***ALG, ARTH, LRNG* (MS)**

Hitt, Fernando. (1994, Fall). Teachers' difficulties with the construction of continuous and discontinuous functions. *Focus on Learning Problems in Mathematics*, *16*(4), 10-20.

Questionnaire data from (n=117) mathematics teachers showed that teachers had a tendency to think only in terms of continuous functions, yet had little skill in constructing continuous functions. They scarcely considered discontinuous functions. ***CALS, TKNW, ALG* (HS, PS)**

Holden, Constance. (1994, August). Science and math scores rebound. *Science*, *265*, 1167.

Provides the statistics and a brief analysis of the recent elementary and secondary science and math scores on the 1992 National Assessment of Educational Progress achievement test.

***LSAS* (K-12)**

Hood, Jacqueline N.; Togo, Dennis F. (1994, Winter). Gender effects of graphics presentation. *Journal of Research on Computing in Education*, *26*(2), 176-184.

Accounting students (n=114) were presented data in either a graphical or a tabular format. Males performed better than females and individuals receiving tabular format outperformed those receiving graphical format. ***GEND, REP*** **(PS)**

Hutchinson, Janet R.; Huberman, Michael. (1994, March). Knowledge dissemination and use in science and mathematics education: A literature review. *Journal of Science Education and Technology*, *3*(1), 27-47.

Reviews the research on knowledge use in science and mathematics education and highlights approaches and strategies for dissemination. ***REVW*** **(K-12)**

Inkpen, Kori; and others. (1994). "We have never-forgetful flowers in our garden": Girls' responses to electronic games. *Journal of Computers in Mathematics and Science Teaching*, *13*(4), 383-403.

This paper describes how girls interact within an electronic games environment. Girls were observed and interviewed to determine their interest in electronic games, how they play and watch others play, and how the presence of others affects their play.

GEND, TECH, AFF, SOC **(K-12)**

Jaspers, Monique W.; Van Lieshout, Ernest C. (1994, Spring). Diagnosing wrong answers of children with learning disorders solving arithmetic word problems. Special issue: Dutch research on knowledge-based instructional systems. *Computers in Human Behavior*, *10*(1), 7-19.

Sixty-six children attending a Dutch school for educable mentally retarded children, grades 4-7, took pretests for reading and arithmetic ability to see whether identification of specific errors could aid in developing an intelligent tutoring system for word problems.

D/R, LD, CAI **(EL)**

Jiang, Zhonghong; Potter, Walter D. (1994). A computer microworld to introduce students to probability. *Journal of Computers in Mathematics and Science Teaching*, *13*(2), 197-222.

Describes a simulation-oriented computer microworld called CHANCE used to overcome the limitations of physical materials for experiments in introductory probability. A teaching experiment conducted with four middle school and high school students is discussed.

PROB, SOFT, TCHG **(SE)**

Johnson, David C.; and others. (1994, December). The origins of the JRME: A retrospective account. *Journal for Research in Mathematics Education*, *25*(6), 560-582.

Discusses the origins of JRME, focusing on mathematics education in the '50s and '60s, establishment of the Research Advisory Committee of NCTM, publication of Research in Mathematics Education, and the initial structure, policy, and procedures for the new journal.

RSCH **(ALL)**

Johnson-Gentile, Kay; Clements, Douglas H.; Battista, Michael T. (1994). Effects of computer and noncomputer environments on students' conceptualizations of geometric motions. *Journal of Educational Computing Research*, *11*(2), 121-140.

Two treatment groups, one using Logo and one using manipulatives and paper and pencil, received eight lessons on geometric motions. Both groups, especially the Logo group, outperformed a control group on geometric thinking. ***GEOM, MANP, SOFT*** **(EL)**

Jones, Graham A.; and others. (1994, September). A model for nurturing and assessing multidigit number sense among first grade children. *Educational Studies in Mathematics, 27*(2), 117-143.

Describes the development, refinement, and validation through six case studies of a framework for nurturing and assessing multidigit number sense in young children, including counting, partitioning, grouping, and number relationships. ***NSNS* (EC)**

Jones, Tricia. (1994). Video and multimedia for math and science instruction. *Journal of Computers in Mathematics and Science Teaching, 13*(2), 128-145.

This review focuses on ways that video, alone and with other media, has been used for math and science teaching. Specific curricular materials are examined, and areas of needed research are identified. ***REVW*, *TECH* (K-12)**

Kaput, James J.; Thompson, Patrick W. (1994, December). Technology in mathematics education research: The first 25 years in the JRME. *Journal for Research in Mathematics Education, 25*(6), 667-684.

Discusses the interactions between technology and research in mathematics education, including CAI, role of technology in learning, use of microworlds to study concept formation, research methodologies, interactive technologies, and lack of technology-related research in JRME. ***REVW*, *TECH* (ALL)**

Kaur, Berinderjeet; Sharon, Boey Huey Peng. (1994, Fall). Algebraic misconceptions of first year college students. *Focus on Learning Problems in Mathematics, 16*(4), 43-58.

An algebra test administered to (n=18) first-year college students found: a disregard for negative numbers, ineffective use of counterexamples, misapplication of rules, and a lack of a good grasp of relevant mathematical terminology. ***ALG*, *ARTH*, *KNW* (PS)**

Keeler, Carolyn M.; and others. (1994, Autumn). Cooperative learning in statistics. *Teaching Statistics, 16*(3), 81-84.

Cooperative learning techniques proved effective in improving student performance and retention in a freshman level statistics course. Lectures interspersed with group activities proved effective in increasing conceptual understanding and overall class performance. ***GRPG*, *STAT*, *ACH*, *LRNG* (PS)**

Khoury, Helen A.; Zazkis, Rina. (1994, September). On fractions and non-standard representations: Pre-service teachers' concepts. *Educational Studies in Mathematics, 27*(2), 191-204.

Investigated (n=124) pre-service teachers' reasoning and concepts of invariance of fractional numbers under numeration systems in different bases. Most students believed that fractions change their numerical value under different symbolic representations. ***EQV*, *FRAC*, *PRSV* (K-12)**

Kieran, Carolyn. (1994, December). Doing and seeing things differently: A 25-year retrospective of mathematics education research on learning. *Journal for Research in Mathematics Education*, 25(6), 583-607.

Features interviews with Thomas Kieren and Thomas Romberg and discussion of the evolution of views on mathematical learning, including constructivist interpretations, situated cognition, and a social-interactionist Vygotskian orientation. ***LRNG*, *REVW*, *STYL* (ALL)**

Kloosterman, Peter; Cougan, Monica Clapp. (1994, March). Students' beliefs about learning school mathematics. *The Elementary School Journal, 94*(4), 375-388.

Students (n=62) in grades 1-6 believed that anyone who tried could learn mathematics; moderate achievers were just as confident as high achievers; and there was little evidence of a relation between parental support and student achievement. ***Ach, Aff, Soc*** **(El)**

Kohler, Frank W.; Ezell, Helen; Hoel, Kathryn; Strain, Phillip S. (1994, March). Supplemental peer practice in a first-grade math class: Effects on teacher behavior and five low achievers' responding and acquisition of content. *The Elementary School Journal, 94*(4), 389-403.

Two treatments, one of teacher-directed activities and one a supplemental peer practice activity, were compared in a first-grade mathematics class. Supplemental practice with peers increased students' active responding and acquisition of content. ***Ach, Tchg*** **(EC)**

Koyama, Masataka. (1994, March). Research into relationship between the computational estimation ability and strategy and the mental computation ability: Analysis of a survey of the fourth, fifth, and sixth graders in Japan. *Hiroshima Journal of Mathematics Education, 2*, 35-44.

Tests of computational estimation ability (CEA), strategy (CES), and mental computation ability (MCA) of (n=124) 4th-, (n=143) 5th-, and (n=84) 6th-graders found significant relationships between CEA and MCA and between CEA and CES, but not between MCA and CES. ***Arth, Est*** **(El)**

Lambdin, Diana V.; and others. (1994, April). Connecting research to teaching: Reflections on mathematics education research over the twenty-five years of JRME. *Mathematics Teaching in the Middle School, 1*(1), 38-43.

Discusses educational research in mathematics, the relevance of research for classroom teachers, trends in the kinds of research being conducted in mathematics education, tips for reading research studies, and unanswered questions from research. ***Impl, Rsch*** **(K-12)**

Lauten, A. Darien; and others. (1994, June). Student understanding of basic calculus concepts: Interaction with the graphics calculator. *The Journal of Mathematical Behavior, 13*(2), 225-237.

Describes five college and two high school students' understandings of function and limit in a graphics calculator-based environment and identifies instances where students' understanding seems to have been influenced by the availability of a graphing calculator.

Cals, GCal **(HS, Ps)**

Lawler, Robert W. (1994, June). Consider the particular case. *The Journal of Mathematical Behavior, 13*(2), 241-253.

Reflects on the process of problem solving in the particular case of light reflection physics and abstracts objectives, methods, and values that can help (a) solve problems in the human sciences and (b) evaluate solutions using the Strategy Learner. ***PS, Rep*** **(HS)**

Lawson, Michael J.; Chinnappan, Mohan. (1994). Generative activity during geometry problem solving: Comparison of the performance of high-achieving and low-achieving high school students. *Cognition and Instruction, 12*(1), 61-93.

High-achieving (HA) and low-achieving (LA) Year 11 students were compared during solution of geometry problems. HA students not only accessed more geometric knowledge but also used it more effectively, and they more frequently managed their processing behavior.

Ach, Geom, PS, Knw, Mtcg **(HS)**

Lehman, Jeffrey R. (1994a, February). Integrating science and mathematics: Perceptions of preservice and practicing elementary teachers. *School Science and Mathematics, 94*(2), 58-64.

Responses to a questionnaire given to (n=161) undergraduate elementary education majors and (n=60) elementary teachers found that the preservice teachers were more likely to prefer that math and science be integrated in the elementary grades. ***IC, TBLF*** **(EL)**

Lehman, Jeffrey R. (1994b, April). Technology use in the teaching of mathematics and science in elementary schools. *School Science and Mathematics, 94*(4), 194-202.

Surveys of (n=80) elementary school principals showed that teachers used microcomputers more in mathematics than science, and microcomputer and calculator use was more common in intermediate grades than in primary grades. ***TECH, CALC, COMP*** **(EL)**

Lembke, Linda O.; Reys, Barbara J. (1994, May). The development of, and interaction between, intuitive and school-taught ideas about percent. *Journal for Research in Mathematics Education, 25*(3), 237-259.

Reports on conceptual understanding and solution strategies for percent problems of (n=31) students of two ability levels in grades 5, 7, 9, and 11. Strategies evolved from intuitive to formal and increased in diversity with increasing age. ***LRNG, PCT*** **(SE)**

Lester, Frank K. (1994, December). Musings about mathematical problem-solving research: 1970-1994. *Journal for Research in Mathematics Education, 25*(6), 660-675.

Provides a brief overview of past research in mathematical problem solving, discusses the apparent recent decline in research in this area, and suggests some issues and questions for future investigation. ***PS, REVW*** **(ALL)**

Lo, Jane-Jane; and others. (1994, January). The participation, beliefs, and development of arithmetic meaning of a third-grade student in mathematics class discussions. *Journal for Research in Mathematics Education, 25*(1), 30-49.

Analyzes one third-grader's participation in class discussions, his beliefs, and his arithmetical development during a year in a problem-centered classroom. Concludes that fruitful class discussion both necessitates and is facilitated by negotiation of social norms and mathematics meanings. ***BLF, LRNG, ORAL, SOC*** **(EC)**

Lo, Jane-Jane; Wheatley, Grayson H. (1994, September). Learning opportunities and negotiating social norms in mathematics class discussion. *Educational Studies in Mathematics, 27*(2), 145-164.

Describes the relationship between learning opportunities and the negotiation of social norms in mathematics class discussions based on data from interviews and observation of a third-grade classroom. Includes several transcripts of observations. ***ORAL, SOC*** **(EC)**

Lovett, Marsha C.; Anderson, John R. (1994, March). Effects of solving related proofs on memory and transfer in geometry problem solving. *Journal of Experimental Psychology, 20*(2), 366-378.

Results suggest that diagrams are the basis for geometry problem-solving memories and that the structure and quality of problem-solving memories affect problem-solving transfer. ***GEOM, PS, REP*** **(HS)**

Lubinski, Cheryl A.; and others. (1994, December). Levels of introspection in mathematics instruction. *Mathematics Education Research Journal, 6*(2), 113-130.

Case studies of (n=5) K-3 teachers found three levels of introspection in the teachers, rank-ordered by the degree to which children's thinking was utilized in their decision-making processes. ***MTCG, PLAN*** **(EC)**

Lubinski, Cheryl Ann; Vacc, Nancy Nesbitt. (1994, April). Implementing the Professional Standards for Teaching Mathematics: The influence of teachers' beliefs and knowledge on learning environments. *Arithmetic Teacher*, *41*(8), 476-479.

Discusses the effect on classroom learning environments of teacher beliefs about mathematics and teaching, teacher knowledge of children's thinking, teacher knowledge of content, and worthwile mathematical tasks. ***IMPL, TBLF, TKNW*** **(EL)**

Marine, Claudette; Escribe, Christian. (1994, December). Metacognition and competence on statistical problems. *Psychological Reports*, *75*, 1403-1408.

Analysis showed a relation in (n=38) undergraduate students between statistical competence and metacognitive knowledge of tasks and strategies in statistics. Perceived competence appeared separate from metacognitive knowledge and cognitive performance.

MTCG, STAT **(PS)**

Markovits, Zvia; Sowder, Judith. (1994, January). Developing number sense: An intervention study in grade 7. *Journal for Research in Mathematics Education*, *25*(1), 4-29.

Results of instructing (n=12) male seventh-grade students toward developing number sense indicate that after instruction students were more likely to use strategies that reflected number sense to solve number magnitude, mental computation, and estimation problems.

NSNS, EST, STYL **(MS)**

McCoy, Leah P. (1994, May). Mathematical problem-solving processes of elementary male and female students. *School Science and Mathematics*, *94*(5), 266-270.

Observation and interviews of (n=90) 2nd- and 3rd-graders' mathematical problem-solving behavior found that the children readily attempted unfamiliar problems and used systematic solution processes. Found no significant gender differences. ***GEND, PS*** **(EC)**

McLeod, Douglas B. (1994, December). Research on affect and mathematics learning in the JRME: 1970 to present. *Journal for Research in Mathematics Education*, *25*(6), 637-647.

Discusses research on affective issues as it has developed over the life of the JRME, including: student beliefs and mathematics learning, emotional responses to mathematics, and new approaches to affective issues. ***AFF, REVW, BLF, LRNG*** **(ALL)**

Melancon, Janet G.; Thompson, Bruce; Beenel, Shirley. (1994, Spring). Measurement integrity of scores from the Fennema-Sherman Mathematics Attitude Scales: The attitudes of public school teachers. *Educational and Psychological Measurement*, *54*(1), 187-192.

This study explored the measurement integrity of scores on the Fennema-Sherman Mathematics Attitude Scales using data provided by public elementary school teachers. Both factor structure and sensitivity to socially desirable response set were investigated.

ASSM, ATT, TATT **(K-12)**

Miller, Cynthia A.; Smith, Brenda D. (1994, Spring). Assessment of prerequisite mathematics vocabulary terms for intermediate and college algebra. *Focus on Learning Problems in Mathematics*, *16*(2), 39-50.

Pre- and posttests of prerequisite vocabulary terms were given to (n=162) intermediate and (n=178) college algebra students to determine their word knowledge and differences between the intermediate and college algebra students. ***ALG, LANG*** **(HS, PS)**

Mills, Carol J.; and others. (1994, November). Academically talented students' achievement in a flexibly paced mathematics program. *Journal for Research in Mathematics Education*, *25*(5), 495-511.

Third- through sixth-grade mathematically talented students (n=306) enrolled in a flexibly paced university mathematics course far exceeded the normative achievement gains expected over a one-year period. **ACH, GIFT (EL)**

Moore, Charles G. (1994, June). Research in Native American mathematics education. *For the Learning of Mathematics, 14*(2), 9-14.

Discusses past research involving Piagetian conservation concepts in Native American students; the relation of language to mathematics education; holism in mathematics learning; mathematics and culture; and mentorship in an atmosphere of cultural diversity.
ETHN, REVW, LANG, LRNG, SOC (SE, PS)

Moore, Robert C. (1994, October). Making the transition to formal proof. *Educational Studies in Mathematics, 27*(3), 249-266.

Observations and interviews with (n=16) undergraduate mathematics and mathematics education majors learning to do formal proofs found three major sources of difficulty: concept understanding, mathematical language and notation, and how to start a proof.
PRF, LANG, LRNG (PS)

Morton, Margaret; and others. (1994, June). A comparative study of two nationwide examinations: Maths with calculus and maths with statistics. *Educational Studies in Mathematics, 26*(4), 367-387.

On two examinations taken by 12th-grade students (n=13,522 for calculus; n=18,031 for statistics) in New Zealand, males outscored females, significantly in statistics. Some differences moderated when mathematics coursework was factored in.
CALS, LSAS, STAT, ACH, GEND (HS, PS)

Nattiv, Amalya. (1994, January). Helping behaviors and math achievement gain of students using cooperative learning. *The Elementary School Journal, 94*(3), 285-297.

Achievement gains in students (n=101), grades 3-5, both boys and girls, correlated positively with "giving explanations," "receiving explanations," and "giving and receiving other help"; correlated negatively with "receiving no help after requesting it."
ACH, GRPG, GEND, SOC (EL)

Nemirovsky, Ricardo. (1994, December). On ways of symbolizing: The case of Laura and the velocity sign. *The Journal of Mathematical Behavior, 13*(4), 389-422.

Presents a case study of how one eleventh grader learned the meaning of the velocity sign. Her learning was not just an acknowledgment of a rule, but a broad questioning and revision of her thinking about graphs and motion. **LRNG, REP (HS)**

Nesher, Pearla; Hershkovitz, Sara. (1994, January). The role of schemes in two-step problems: Analysis and research findings. *Educational Studies in Mathematics, 26*(1), 1-23.

Studied schemes involved in solving two-step arithmetic word problems in (n=1824) elementary schoolchildren in Israel. Compound schemes and combinations of operations were found to affect the difficulty level of the problems. **LRNG, PS (EL)**

Newman, Elise. (1994, Spring). Predicting grades in Basic Algebra. *AMATYC Review, 15*(2), 47-53.

Data from (n 470) students at Owens Technical College showed that high school GPA was the best predictor of grades in Basic Algebra, followed by high school rank, college GPA, ACT natural sciences, ASSET numerical skills, and ASSET elementary algebra scores.
ACH, DEVM, ALG, ASSM (PS)

Niaz, Mansoor. (1994, May). The role of insight in problem solving. *Journal of College Science Teaching*, *23*(6), 334-337.

Reviews psychology literature on the nine-dot problem and suggests implications of research on insight problems. Insight problems are problems that require "flashes of insight" or "leaps of logic" on the part of the solver.

***PS, REVW* (Ps)**

Norwood, Karen S. (1994, May). The effect of instructional approach on mathematics anxiety and achievement. *School Science and Mathematics*, *94*(5), 248-254.

Scores on mathematics anxiety and arithmetic achievement tests of (n=123) college students taught arithmetic using rule-oriented versus concept-oriented instructional approaches showed a significant difference in posttest anxiety scores between the two groups.

***ACH, ANX, TCHG, ARTH, DEVM* (Ps)**

Nunokawa, Kazuhiko. (1994, September). Solver's structures of a problem situation and their global restructuring. *The Journal of Mathematical Behavior*, *13*(3), 275-297.

Analysis shows that the solver's structures were modified during the solution process in a global restructuring based on certain characteristics of the solver's mental representations.

***LRNG, PS, REP* (K-12)**

O'Melia, Mary C.; Rosenberg, Michael S. (1994, May). Effects of cooperative homework teams on the acquisition of mathematics skills by secondary students with mild disabilities. *Exceptional Children*, *60*(6), 538-548.

Middle school students (n=171) with mild disabilities who participated in CHT had significantly higher (1) rates of homework completion and (2) percentages correct on homework but did not differ significantly from control students on a global measure of mathematics achievement.

***GRPG, LD, SOC* (MS)**

Odafe, Victor U. (1994, Spring). Students' perceptions of myths about mathematics. *AMATYC Review*, *15*(2), 60-67.

Surveys of (n=295) undergraduate students in college algebra and precalculus about their perceptions of mathematics found that agreement with some myths can be reduced with more mathematical preparation. Suggests strategies to overcome these myths.

***BLF, ALG, CALS* (Ps)**

Paas, Fred G. W. C.; Van Merrienboer, Jeroen J. G. (1994, March). Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of Educational Psychology*, *86*(1), 122-133.

Results showed that students who studied worked examples gained most from high-variability examples, invested less time and mental effort in practice, and attained better transfer performance than students who tried to solve problems before seeing worked examples.

***CAI, GEOM, PS* (SE)**

Pajares, Frank; Miller, M. David. (1994, June). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology*, *86*(2), 193-203.

Results (n=350) revealed that math self-efficacy was more predictive of problem solving than was math self-concept, perceived usefulness of mathematics, prior experience with mathematics, or gender. Males had higher performance, self-efficacy, and self-concept.

***AFF, GEND, PS, SOC* (Ps)**

Parmar, Rene S.; Cawley, John F.; Miller, James H. (1994, May). Differences in mathematics performance between students with learning disabilities and students with mild retardation. *Exceptional Children*, *60*(6), 549-563.

Results based on a large sample of students, ages 8-14, indicated that students with learning diabilities scored higher and had greater growth rates than students with mild mental retardation in basic mathematical concepts, vocabulary, problem solving, and fractions.

ACH, LD, FRAC, LANG, PS **(EL)**

Perrenet, Jacob C.; Wolters, Miriam A. (1994, September). The art of checking: A case study of students' erroneous checking behavior in introductory algebra. *The Journal of Mathematical Behavior, 13*(3), 335-358.

Testing and interviews with (n=83) 8th-grade students presented with a set of linear equation-solving tasks revealed two categories of checking behavior: structurally erroneous and executionally erroneous. Relates solving and checking behavior to metacognition.

ALG, MTCG **(MS)**

Perry, A. D.; Stacey, Kaye. (1994, Summer). The use of taught and invented methods of subtraction. *Focus on Learning Problems in Mathematics, 16*(3), 12-22.

Using taught algorithms versus invented methods of subtraction was related to age, mathematical achievement, and lateral thinking ability in (n=1370) male secondary school students. Use of invented algorithms increased with age. ***A/S, LRNG*** **(SE)**

Philipp, Randolph A.; and others. (1994, June). Conceptions and practices of extraordinary mathematics teachers. *The Journal of Mathematical Behavior, 13*(2), 155-180.

Characterizes the commonalities of four exemplary mathematics teachers in terms of their mathematical preparation; conceptions of mathematics, roles of teachers and students, assessment, and teaching; and their teaching practices. ***TCHG, TCHR, TBLF, TKNW*** **(MS)**

Pierce, Karen A.; Gholson, Barry. (1994, September). Surface similarity and relational similarity in the development of analogical problem solving: Isomorphic and nonisomorphic transfer. *Developmental Psychology, 30*(5), 724-737.

Surface and relational similarity were examined using analogs of the missionaries-cannibals (MC) problem with K-, 3rd-, and 6th-grade children. The 3rd- and 6th-graders transferred relational similarity significantly more frequently than kindergartners. ***PS*** **(EL)**

Pirie, Susan; Kieren, Thomas. (1994, March). Growth in mathematical understanding: How can we characterise it and how can we represent it?. *Educational Studies in Mathematics, 26*(2-3), 165-190.

Proposes a model for the growth of mathematical understanding based on the consideration of understanding as a whole, dynamic, levelled but non-linear process. Illustrates the model using the concept of fractions. How to map the growth of understanding is explained in detail.

LRNG, REP, FRAC **(K-12)**

Ponte, Joao P.; and others. (1994, June). Teachers' and students' views and attitudes towards a new mathematics curriculum: A case study. *Educational Studies in Mathematics, 26*(4), 347-365.

Discusses the beliefs and attitudes of (n=7) mathematics teachers, (n=19) 7th- and 10th-grade students, and others participating in a pilot curriculum development program stressing active methodologies and group work. ***CURR, TCHG, AFF, TATT, TBLF*** **(SE)**

Prawat, Richard S.; Anderson, Ariel L. H. (1994, June). The affective experiences of children during mathematics. *The Journal of Mathematical Behavior, 13*(2), 201-221.

Stimulated recall was used to examine the affective experiences of (n=32) 4th- and 5th-graders engaged in mathematics seatwork. Students' affect was primarily negative and achievement related. Anger was the most prevalent affective response. ***ACH, AFF*** **(EL)**

Quesada, Antonio R.; Maxwell, Mary E. (1994, September). The effects of using graphing calculators to enhance college students' performance in precalculus. *Educational Studies in Mathematics*, *27*(2), 205-215.

Compared the performance of (n=710) college students taught precalculus using graphing calculators versus the traditional approach. Students in the calculator group scored significantly higher than the control on a comprehensive final exam. **CALS, GCAL, ACH (Ps)**

Randhawa, Bikkar S. (1994a, June). Theory, research, and assessment of mathematical problem solving. Special issue: Cognition and assessment. *Alberta Journal of Educational Research*, *40*(2), 213-231.

A study involving (n=40) 12th-graders found differences by gender in approaches to mathematical problem solving. Results suggest that competence is characterized by a content knowledge base and knowledge of metacognitive strategies. **GEND, PS, KNW, MTCG (HS)**

Randhawa, Bikkar S. (1994b, October). Self-efficacy in mathematics, attitudes, and achievement of boys and girls from restricted samples in two countries. *Perceptual and Motor Skills*, *79*, 1011-1018.

A Saskatchewan sample of (n=191) (99 males, 92 females) and a Western Australian sample of (n=134) (49 males, 85 females) Grade 12 students showed significant effects for gender, locale, and their interaction on measures of achievement, self-efficacy, and attitude.

ACH, AFF, CC, GEND (HS)

Reed, Stephen K.; Willis, Diane; Guarino, Jeannine. (1994, September). Selecting examples for solving word problems. *Journal of Educational Psychology*, *86*(3), 380-388.

College students studied simple and complex examples, then used the examples to construct equations for algebra word problems. Evidence for good metacognitive skills included matching examples with test problems and preference for complex examples.

ALG, PS, REP, MTCG (Ps)

Relich, Joe; and others. (1994, July). Attitudes to teaching mathematics: Further development of a measurement instrument. *Mathematics Education Research Journal*, *6*(1), 56-69.

Presents an attempt to develop an instrument to monitor attitudinal changes towards mathematics among (n=345) preservice student teachers. **ASSM, TANX, TATT (EL)**

Ruthven, Kenneth; Coe, Robert. (1994, July). A structural analysis of students' epistemic views. *Educational Studies in Mathematics*, *27*(1), 101-109.

Views of (n=70) 16- and 17-year-olds on mathematical knowledge, activity, and learning showed no simple systematic relationship between beliefs about (a) the nature of mathematical knowledge and (b) the teaching and learning of mathematics. **BLF, LRNG, PRF, TCHG (HS)**

Saenz-Ludlow, Adalira. (1994, January). Michael's fraction schemes. *Journal for Research in Mathematics Education*, *25*(1), 50-85.

A teaching experiment with (n=6) third graders showed that their quantitative reasoning with fractions was based on their quantitative reasoning with natural numbers. Presents the constructive itinerary of one of the most advanced children in the group. **FRAC, LRNG (EC)**

Samimy, Keiko; and others. (1994, September). *Gambare*, *amae*, and *giri*: A cultural explanation for Japanese children's success in mathematics. *The Journal of Mathematical Behavior*, *13*(3), 261-271.

Presents a conceptual framework to explain the differential success of Japanese children in mathematics learning based on Stevenson and Stigler's effort-versus-ability model, and argues that the Japanese effort model needs to be examined in a social context.

ACH, CC, LRNG, SOC (K-12)

Sayers, Roy. (1994, June). Gender differences in mathematics education in Zambia. *Educational Studies in Mathematics*, *26*(4), 389-403.

Gender differences in mathematics education were found to be present in Zambia both in terms of access and performance. Possible reasons for such differences are examined in light of attitude questionnaires, including the role of teachers. **ACH, GEND, ATT (K-12)**

Schiddell, Betty L; Ethington, Corinna A. (1994, Spring). Teaching of geometry in the eighth grade mathematics curriculum: Findings from the Second International Mathematics Study. *Focus on Learning Problems in Mathematics*, *16*(2), 51-61.

Describes the typical eighth-grade geometry curriculum (content, time allocations, instructional methodologies, and other factors) of (n=109) typical and (n=23) enriched mathematics classrooms in the United States based on data from SIMS. **CURR, GEOM, LSAS (MS)**

Schoenfeld, Alan H. (1994a, March). What do we know about mathematics curricula? *The Journal of Mathematical Behavior*, *13*(1), 55-80.

Discusses four major issues related to the mathematics curriculum and what research says about each of them, namely: questions of content, tracking, problem-based curricula, and the role of proof. **CURR, REVW, GRPG, PS, PRF (K-12)**

Schoenfeld, Alan H. (1994b, December). A discourse on methods. *Journal for Research in Mathematics Education*, *25*(6), 697-710.

Discusses the historical context of mathematics education research methodologies, describes methodological trends as reflected in JRME, focusing on the domain of teacher knowledge and practice, and considers theoretical and methodological issues of the present and future. **REVW, RSCH, TCHG, TKNW (K-12)**

Sfard, Anna; Linchevski, Liora. (1994, March). The gains and the pitfalls of reification—The case of algebra. *Educational Studies in Mathematics*, *26*(2-3), 191-228.

Analyzes the nature and growth of students' algebraic knowledge and thinking, focusing on two crucial transitions: from the purely operational algebra to the structural algebra of a fixed value of an unknown and then to the functional algebra of a variable. **ALG, LRNG (SE)**

Shama, Gilli; Dreyfus, Tommy. (1994, January). Visual, algebraic and mixed strategies in visually presented linear programming problems. *Educational Studies in Mathematics*, *26*(1), 45-70.

Classified solution strategies of (n=49) 10th-grade students presented with linear programming problems in a predominantly visual setting in the form of a computerized game. Visual strategies were developed more frequently than either algebraic or mixed strategies. **COMP, PS, REP, ALG, VIS (HS)**

Shaughnessy, Michael F.; Stockard, Jody; Moore, Jack; Siegel, Carole. (1994, August). Scores on the 16 personality factor questionnaire and success in college calculus. *Psychological Reports*, *75*, 348-350.

This study explored the association of scores for (n=94) pharmacy majors on the 16 Personality Factor Questionnaire and grades in college calculus. Results showed that high scorers in calculus tended to be exacting, persevering, responsible, and conscientious. **CALS, PERS (PS)**

Shroyer, M. Gail; and others. (1994, February). Science and mathematics equity issues at a local school district level. *School Science and Mathematics*, *94*(2), 65-77.

Compares one school district's data with national data and analyzes what factors reinforce and perpetuate inequitable situations for females in science and mathematics. Provides a model for school districts to conduct self-study of gender equity education issues. **GEND (K-12)**

Sigurdson, Sol E.; and others. (1994, December). Problem solving and mathematics learning. *The Journal of Mathematical Behavior, 13*(4), 361-388.

Investigation of (n=41) 8th-grade mathematics classrooms in which, of three teaching approaches (algorithmic practice, teaching with meaning, and problem-process approach), the problem-process groups showed increased achievement and improved student attitudes.

***PS, TCHG, ACH, ATT* (MS)**

Silver, Edward A.; Kilpatrick, Jeremy. (1994, December). E pluribus unum: Challenges of diversity in the future of mathematics education research. *Journal for Research in Mathematics Education, 25*(6), 734-754.

Discusses two major themes that emerged from analysis of interviews with mathematics educators: the nature and role of research within the field of mathematics education and the increasingly international character of the community involved in that research.

CC, *RSCH* (ALL)

Simon, Martin A. (1994, January). Learning mathematics and learning to teach: Learning cycles in mathematics teacher education. *Educational Studies in Mathematics, 26*(1), 71-94.

Presents a framework used in shaping two major mathematics teacher education projects, derived from a social constructivist view of learning and incorporating French didactical theory. Describes interconnections between different domains of teacher knowledge.

***LRNG, PRSV, SOC, TKNW* (K-12)**

Simon, Martin A.; Blume, Glendon W. (1994a, June). Mathematical modeling as a component of understanding ratio-as-measure: A study of prospective elementary teachers. *The Journal of Mathematical Behavior, 13*(2), 183-197.

Describes the development of the ability to identify a ratio as the appropriate measure of a given attribute by (n=26) prospective elementary teachers. Procedural approaches to teaching did not challenge students to develop their own mathematical models of the world.

***FRAC, MEAS, PRSV, REP* (EL)**

Simon, Martin A.; Blume, Glendon W. (1994b, November). Building and understanding multiplicative relationships: A study of prospective elementary teachers. *Journal for Research in Mathematics Education, 25*(5), 472-494.

A study of (n=26) prospective elementary teachers' understanding of the area of a rectangular region as a multiplicative relationship between the lengths of the sides resulted in the development of a description of the quantitative reasoning involved. ***M/D, MEAS, PRSV* (EL)**

Skaalvik, Einar M.; Rankin, Richard J. (1994, November). Gender differences in mathematics and verbal achievement, self-perception and motivation. *British Journal of Educational Psychology, 64*, 419-428.

Subjects were (n=256) sixth-grade and (n=353) ninth-grade Norwegian students. There were no gender differences in mathematics achievement, but boys had higher self-concepts, self-perceived skill, and motivation in mathematics than girls did. ***ACH, AFF, GEND* (SE)**

Skovsmose, Ole. (1994, July). Towards a critical mathematics education. *Educational Studies in Mathematics, 27*(1), 35-57.

Illustrates aspects of a reflective mathematics education using a project for 14- and 15-year-olds to develop different types of knowing: mathematical skills and concepts; technological competence; and reflective evaluations of consequences. ***KNW, MTCG, LRNG, TECH* (HS)**

Smith, Karan B. (1994). Studying different methods of technology integration for teaching problem solving with systems of equations and inequalities and linear programming. *Journal of Computers in Mathematics and Science Teaching, 13*(4), 465-479.

A computer algebra system was integrated into instruction for two large classes of mathematics for business and the social sciences. Comparisons of student achievement and attitude showed no significant differences, but other implications of the study are discussed.

***CII, PS, ALG* (Ps)**

Sophian, Catherine; McCorgray, Patricia. (1994). Part-whole knowledge and early arithmetic problem solving. *Cognition and Instruction, 12*(1), 3-33.

Two experiments support the conclusion that an understanding of the relationship between a superordinate set and the basic sets that comprise it develops between 4 and 5 years of age.

***A/S, NSNS* (EC)**

Sowder, Judith; Schappelle, Bonnie. (1994, February). Research into practice: Number sense-making. *Arithmetic Teacher, 41*(6), 342-345.

Discusses various research findings aimed at helping teachers provide a classroom climate that induces better number sense. Focuses on number and symbol meaning, including size, place value, and fractions, as well as computation and computational estimation.

***IMPL, NSNS* (EL)**

Speiser, Bob; Walter, Chuck. (1994, June). Catwalk: First-semester calculus. *The Journal of Mathematical Behavior, 13*(2), 135-152.

Describes the use of time-lapse photographs of a running cat as a model to investigate the concepts of function and derivative in a college calculus course. Discusses student difficulties and implications for teachers. ***CALS, REP* (HS, Ps)**

Steffe, Leslie P.; Kieren, Thomas. (1994, December). Radical constructivism and mathematics education. *Journal for Research in Mathematics Education, 25*(6), 711-733.

Analyzes the influence of constructivist thought on mathematics educators since 1960, including Piaget's cognitive-development psychology, a preconstructivist and constructivist revolution, and the current reform movement in school mathematics. ***LRNG, RSCH* (ALL)**

Steffe, Leslie P.; Wiegel, Heide G. (1994, March). Cognitive play and mathematical learning in computer microworlds. *Educational Studies in Mathematics, 26*(2-3), 111-134.

Describes studies of children involved in cognitive play activities using discrete and continuous computer microworlds and their transformation of these activities into independent mathematical activity. ***LRNG, SOFT* (EL)**

Sullivan, Peter; Mousley, Judith. (1994, July). Quality mathematics teaching: Describing some key components. *Mathematics Education Research Journal, 6*(1), 4-22.

A survey of (n=125) teacher educators and experienced teachers identified six major components of quality teaching: communicating, problem solving, building understanding, engaging, nurturing, and organizing for learning. Presents a model that links the categories.

***TBLF, TCHG* (K-12)**

Suydam, Marilyn N.; Brosnan, Patricia A. (1994, July). Research on mathematics education reported in 1993. *Journal for Research in Mathematics Education, 25*(4), 375-434.

Annotated listing of research summaries, articles, and dissertations in mathematics education reported in 1993. Grade or age levels are indicated for each citation. Articles and dissertations are indexed by topic. Includes a list of the journals searched. ***REVW* (ALL)**

Tanner, Howard; Jones, Sonia. (1994, December). Using peer and self-assessment to develop modeling skills with students aged 11 to 16: A socio-constructive view. *Educational Studies in Mathematics, 27*(4), 413-431.

An action research project in (n=8) Welsh secondary schools found that participation in peer- and self-assessment involved students in a recursive, self-referential learning process supporting the development of metacognitive skills. **ASSM, MTCG, TCHG (SE)**

Taplin, Margaret. (1994, July). Development of a model to enhance managerial strategies in problem solving. *Mathematics Education Research Journal*, *6*(1), 79-93.

Investigated problem-solving perseverance of (n=40) students in grades 6 and 10 while solving nonroutine number problems. Students who were ultimately successful were more inclined than others to be flexible in their use of strategies. **ARTH, MTCG, PS (SE)**

Thompson, Ian. (1994, June). Young children's idiosyncratic written algorithms for addition. *Educational Studies in Mathematics*, *26*(4), 323-345.

Fourth graders' (n=117) solutions to addition problems were analyzed in terms of standard or idiosyncratic written algorithms. Students had not been taught pencil and paper algorithms. A preference for working from left to right, and a variety of written algorithms were found. **A/S, WRIT (EC)**

Thompson, Patrick W. (1994, March). Images of rate and operational understanding of the Fundamental Theorem of Calculus. *Educational Studies in Mathematics*, *26*(2-3), 229-274.

Discusses a teaching experiment with (n=19) senior and graduate mathematics students. Difficulties with the FTOC stemmed from impoverished concepts of rate of change and poorly developed images of functional covariation and multiplicatively-constructed quantities. **CALS, LRNG (PS)**

Thompson, Patrick W.; Lambdin, Diana. (1994, May). Research into practice: Concrete materials and teaching for mathematical understanding. *Arithmetic Teacher*, *41*(9), 556-558.

Discusses the role of concrete materials in teaching for understanding, including research on the use of concrete materials, seeing mathematical ideas embodied in them, and identifying what teachers want students to understand. **IMPL, MANP, LRNG, REP (EL)**

Thompson, Patrick W.; Thompson, Alba G. (1994, May). Talking about rates conceptually, Part I: A teacher's struggle. *Journal for Research in Mathematics Education*, *25*(3), 279-303.

Examines how one teacher's conceptualizations of rate were encapsulated in the language of numbers and operations which undermined his effort to help a student understand rates conceptually. **FRAC, LANG, TKNW (MS)**

Tinto, Patricia P.; and others. (1994, November). Connecting research to teaching: Classroom research and classroom practice: Blurring the boundaries. *Mathematics Teacher*, *87*(8), 644-48.

Presents a case study that describes the experiences of two classroom mathematics teachers and the impact that their own research has had on themselves as teachers; traces their entry into the world of research beyond the classroom. **IMPL, RSCH, TCHG, ISRV (SE)**

Van Den Heuvel-Panhuizen, Marja. (1994, December). Improvement of (didactical) assessment by improvement of problems: An attempt with respect to percentage. *Educational Studies in Mathematics*, *27*(4), 341-372.

Focuses on the role of mathematics problems in the development of better assessment and gives examples with respect to some key concepts and operations on percentage. Reports results from use of the problems with two seventh-grade classes. **ASSM, PS, PCT (MS)**

Van Voorhis, Judith L.; Anglin, Jacqueline M. (1994, December). Teachers share their mathematics backgrounds: Telling it like it was. *School Science and Mathematics*, *94*(8), 407-412.

Surveys of (n=45) elementary teachers showed that sharing mathematics knowledge, enthusiastic teachers, parental support, and practical uses of mathematics were positive influences. Drill, seatwork, and ability groupings were negative influences. ***AFF, SOC, TCHR* (EL)**

Van Zoest, Laura R.; and others. (1994, July). Beliefs about mathematics teaching held by preservice teachers involved in a first grade mentorship program. *Mathematics Education Research Journal*, 6(1), 37-55.

Beliefs about mathematics teaching of (n=4) preservice mentors of first-grade students were compared with beliefs of (n=103) control students. The intervention group professed significantly stronger belief in a socio-constructivist instructional environment.

***PRSV, SOC, TBLF* (EC)**

Verschaffel, Lieven. (1994, March). Using retelling data to study elementary school children's representations and solutions of compare problems. *Journal for Research in Mathematics Education*, 25(2), 141-165.

Fifth-graders (n=40) solved and retold one-step compare word problems. Students performed better, had shorter reponse times, and retold problems correctly more frequently on consistent-language problems than on inconsistent-language problems. ***A/S, LANG, REP* (MS)**

Voigt, Jorg. (1994, March). Negotiation of mathematical meaning and learning mathematics. *Educational Studies in Mathematics*, 26(2-3), 275-298.

Presents a case study of a first-grade class and their teacher who were observed as they ascribed mathematical meanings of numbers and numerical operations to empirical phenomena. Differences in ascriptions led to negotiation of meanings. ***ARTH, LRNG, SOC* (EC)**

Watson, Jane M. (1994, September). A diagrammatic representation for studying problem-solving behavior. *The Journal of Mathematical Behavior*, 13(3), 305-332.

Describes a mapping procedure which can be used to visually display the strategies used in problem solving. Applies the procedure to solutions of the Three Hungry Men problem.

***PS, REP, LRNG* (K-12)**

Waywood, Andrew. (1994, December). Informal writing-to-learn as a dimension of a student profile. *Educational Studies in Mathematics*, 27(4), 321-340.

Shows that keeping a journal, as defined within the writing-to-learn model, has two salient assessment features: (a) The journals differentiate between students at a particular grade level, and (b) They show a growth in sophistication over successive years. ***ASSM, WRIT* (HS)**

Wearne, Diana; Hiebert, James. (1994, January). Research into practice: Place value and addition and subtraction. *Arithmetic Teacher*, 41(5), 272-274.

Compares the development of two students' understanding of addition and subtraction, one based on memorized rules and the other on the concept of place value. Discusses the effects of different goals for instruction and the importance of understanding place value.

***A/S, IMPL, PLCV, STYL* (EC)**

Webb, Noreen M.; Farivar, Sydney. (1994, Summer). Promoting helping behavior in cooperative small groups in middle school mathematics. *American Educational Research Journal*, 31(2), 369-395.

Six 7th-grade classes studied basic communication skills (only, control) and academic helping skills (both, experimental) and then worked in small groups on a 4-week unit on fractions. Latino and African-American students achieved more in the experimental group.

***ETHN, GRPG, FRAC, SOC* (MS)**

Williams, Dawn M.; Collins, Belva C. (1994, November). Teaching multiplication facts to students with learning disabilities: Teacher-selected versus student-selected material prompts within the delay procedures. *Journal of Learning Disabilities, 27*(9), 589-597.

Results indicated that the constant time delay procedure used with material prompts was effective in teaching multiplication facts to 4 male students with learning disabilities; instruction was more efficient when students were allowed to select the material prompt.

LD, M/D **(MS)**

Wilson, Melvin R. (1994, July). One preservice secondary teacher's understanding of function: The impact of a course integrating mathematical content and pedagogy. *Journal for Research in Mathematics Education, 25*(4), 346-70.

Examined the evolving knowledge of functions and beliefs of a preservice teacher in a course that emphasized mathematical and pedagogical connections. Although her understanding of function changed substantially, her anticipated approach to teaching did not.

ALG, TKNW, TCHG, PRSV, TBLF **(HS)**

Wilson, Melvin R.; Krapfl, Carol M. (1994). The impact of graphics calculators on students' understanding of function. *Journal of Computers in Mathematics and Science Teaching, 13*(3), 252-264.

This review analyzes, in the context of current reform recommendations, literature related to graphics calculators, including some early studies assessing the impact of graphics calculators on the achievement and disposition of secondary and early college students.

ALG, GCAL, REVW **(HS, PS)**

Wisnudel, Michele. (1994). Constructing hypermedia artifacts in math and science classrooms. *Journal of Computers in Mathematics and Science Teaching, 13*(1), 5-15.

This article discusses the rationale for hypermedia, gives examples of students using hypermedia tools to construct artifacts, critiques research that examines the influence on students' learning, and outlines needed research on the effectiveness of hypermedia.

IMPL, TECH, SOFT **(K-12)**

Woods, Rodney W.; Lindsey, Jimmy D. (1994, February). Perceived and actual mathematical competencies of children with visual impairments and learning disabilities. *Psychological Reports, 74*, 238.

This study compared 5 visually impaired learning disabled children's perceived and actual mathematical competencies. Analysis indicated that their perceived competencies were significantly greater than their actual competencies. ***ACH, AFF, LD, LD*** **(EL)**

Woodward, John; Howard, Lisa. (1994, October-November). The misconceptions of youth: Errors and their mathematical meaning. *Exceptional Children, 61*(2), 126-136.

In addition to describing research conducted with TORUS, a diagnostic system for education, the authors suggest that the prevalence of misconceptions in students with learning disabilities argues for more emphasis on conceptual understanding in mathematics.

D/R, LD, SOFT **(K-12)**

Wright, Bob. (1994a, July). Mathematics in the lower primary years: A research-based perspective on curricula and teaching practice. *Mathematics Education Research Journal, 6*(1), 23-36.

Explicates 12 assertions relating to curricula, teaching, learners, and learning environments, including: unchanging and underchallenging curricula, children's number sense, curriculum restraints on teachers, collaborative learning, problem solving, and constructivism.

CURR, REVW, TCHG **(EC)**

Wright, Robert J. (1994b, January). A study of the numerical development of 5-year-olds and 6-year-olds. *Educational Studies in Mathematics*, *26*(1), 25-44.

Profiled interviews of (n=41) kindergarten and first-grade children's numerical development over a school year. Significant mismatches between children's numerical development and typical curricula are described, and changes to current practice are recommended.

***LRNG, NSNS, CURR* (EC)**

Yusuf, Mian Muhammad. (1994). Cognition of fundamental concepts in geometry. *Journal of Educational Computing Research*, *10*(4), 349-371.

Students in a Logo-Based Instruction class had a deeper conceptualization of fundamental concepts in geometry than students in a control class. ***GEOM, LRNG, SOFT* (MS)**

Zambo, Ron; Follman, John. (1994, Spring). Gender-related differences in problem solving at the 6th and the 8th grade levels. *Focus on Learning Problems in Mathematics*, *16*(2), 20-38.

Investigated gender-related differences in the process of solving routine word problems using a nine-step strategy in (n=153) 6th- and (n=149) 8th-grade students. Females were slightly better than males at following the prescribed problem-solving process. ***GEND, PS* (MS)**

Zech, Linda; and others. (1994, November-December). Power on! Bringing geometry into the classroom with videodisc technology. *Mathematics Teaching in the Middle School*, *1*(3), 228-233.

Describes two problem-solving videodisc adventure stories related to geometry and reports reactions of (n=25) teachers and their students who used the adventures. Results showed that teachers and students had increased knowledge of ways to apply geometry.

***GEOM, PS, TECH* (MS)**

Zyl, Tony Vander; Lohr, James W. (1994, October). An audiotaped program for reduction of high school students' math anxiety. *School Science and Mathematics*, *94*(6), 310-313.

Developed and tested an audiotaped program for the reduction of math anxiety of (n=20) 9th- and 10th-grade college-bound students. Those who participated in the treatment had significant reductions in levels of math anxiety. ***ANX* (HS)**

JOURNALS SEARCHED

1	*Alberta Journal of Educational Research*
2	*AMATYC Review*
1	*American Educational Research Journal*
0	*American Journal of Education*
6	*Arithmetic Teacher*
3	*British Journal of Educational Psychology*
3	*Cognition and Instruction*
1	*Computers in Human Behavior*
1	*Developmental Psychology*
1	*Educational and Psychological Measurement*
31	*Educational Studies in Mathematics*
3	*Elementary School Journal*
3	*Exceptional Children*
11	*Focus on Learning Problems in Mathematics*
3	*For the Learning of Mathematics*
1	*Hiroshima Journal of Mathematics Education*
27	*Journal for Research in Mathematics Education*
1	*Journal of College Science Teaching*
8	*Journal of Computers in Mathematics and Science Teaching*
3	*Journal of Educational Computing Research*
7	*Journal of Educational Psychology*
1	*Journal of Educational Research*
1	*Journal of Experimental Child Psychology*
1	*Journal of Experimental Psychology: Learning, Memory, and Cognition*
1	*Journal of Learning Disabilities*
14	*Journal of Mathematical Behavior*
1	*Journal of Research in Science Teaching*
1	*Journal of Research on Computing in Education*
0	*Journal of School Psychology*
1	*Journal of Science Education and Technology*
0	*Mathematics and Computer Education*
10	*Mathematics Education Research Journal*
2	*Mathematics in School*
7	*Mathematics Teacher*
2	*Mathematics Teaching in the Middle School*
1	*Ohio Journal of School Mathematics*
2	*Perceptual and Motor Skills*
2	*PRIMUS*
4	*Psychological Reports*
0	*Review of Educational Research*
11	*School Science and Mathematics*
1	*Science Education*
1	*Science*
2	*Teaching Children Mathematics*
1	*Teaching Statistics*
1	*Theory and Psychology*

RESEARCH PAPERS AND MONOGRAPHS PRODUCED IN 1994

MICHELLE K. REED, *Ohio State University*
GALE A. WATSON, *Ohio State University*

This section lists 57 papers and monographs in mathematics education research dated 1994 and abstracted for the ERIC database by the end of March 1995. Each entry is coded (see Key to Codes) with 1-3 ***MAJOR*** and any number of ***MINOR*** topic codes, as well as the grade **LEVEL** (in parentheses). All entries are indexed by ***MAJOR*** codes at the end of this volume. Please note that studies related to preservice or inservice teacher education are so indicated by the appropriate topic codes (*PSRV*, *ISRV*). The **LEVEL** designated on teacher education studies refers to the grade level(s) at which the intern or teacher participants teach.

Adams, Thomasenia L. (1994). *Graphing function problems in teaching algebra* (Research bulletin, vol. 25, no. 2). Sanibel, FL: Florida Educational Research Council. [SE 054 381]

Results of a study (n=128) investigating the effect on identifying, constructing, and defining functions of using graphing calculators to help in selecting appropriate domains, ranges, and scales of axes for graphing functions. ***ALG***, ***GCAL***, ***REP*** **(PS)**

Berg, Kathleen F. (1994, April). *Scripted cooperation in high school mathematics: Peer interaction and achievement*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 932]

Students (n=26) in an 11th-grade Algebra II/Trigonometry class used a cooperative learning technique called scripted cooperation. The study explored the nature of students' verbal interaction, how that interaction changed over time, and its relationship to achievement.
ACH, ***GRPG***, ***ORAL*** **(HS)**

Borba, Marcelo C. (1994, April). *High school students' mathematical problem posing: An exploratory study in the classroom*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 942]

Eight students chose a theme to be investigated, collected real data, and analyzed it using *Function Probe*, a software package. Observation, interview, and journal data from the students and teacher and written work of the students were compiled. ***AFF***, ***PS***, ***STAT*** **(HS)**

Brodsky, Stan; and others. (1994, November). *An urban Family Math collaborative*. New York: City University of New York. [SE 055 737]

Measured the impact of Family Math on student and parent attitudes, student performance, and teacher behavior using (1993, n=89; 1994, n=234) control and (1993, n=101; 1994, n=211) experimental groups supplemented by parent and teacher interviews.
ACH, ***ATT***, ***MATL***, ***SOC*** **(EL)**

Brosnan, Patricia A.; and others. (1994, April). *An exploration of change in teachers' beliefs and practices during implementation of mathematics standards*. Paper presented at the National Council of Teachers of Mathematics Research Presession, Indianapolis, IN. [SE 054 442]

This two-year study documents changes in four elementary-certified teachers' beliefs and practices while implementing NCTM's Curriculum Standards in the 6th grade. Case studies were analyzed individually and across cases. ***ISRV***, ***TBLF***, ***TCHG*** **(MS)**

Carifio, James; Nasser, Ramzi. (1994, April). *Algebra word problems: A review of the theoretical models and related research literature.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 556]

Integrates current models and theories into a comprehensive model of algebra word-problem-solving behavior. The relational algebra word problem is focused on, because these problems have been researched extensively and students find them difficult.

***ALG, PS, REVW, REP* (SE, PS)**

Carpenter, Thomas P.; and others. (1994, April). *Teaching mathematics for learning with understanding in the primary grades.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 563]

Four programs—Supporting Ten-Structured Thinking, Conceptually Based Instruction, Cognitively Guided Instruction, and Problem Centered Mathematics—show that learning number concepts and operations with understanding is possible under a variety of conditions.

***ARTH, LRNG, NSNS, PS* (EL)**

Chiu, Ming Ming. (1994, April). *Metaphorical reasoning in mathematics: Experts and novices solving negative number problems.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 944]

Interviews of novice middle school students (n=12) and expert master's graduates (n=5) solving negative number tasks show that metaphors can intuitively justify mathematical operations, integrate mathematical knowledge, enhance computational environment, and improve recall.

***INT, LANG, PS, REP* (MS, PS)**

Davenport, Linda Ruiz. (1994, October). *The mathematics outlook: Promoting interest in mathematical careers among girls and women.* Columbus, OH: ERIC/CSMEE. [SE 055 264]

Presents research findings on gender differences in mathematics course taking, mathematics achievement, and choice of careers; reasons for female underparticipation in mathematics; how to encourage females toward mathematical careers; and new questions and directions.

***GEND, IMPL, REVW* (ALL)**

De Corte, Erik; and others. (1994, April). *Pupil-generated multiplicative word problems as a test of the theory of the primitive intuitive models.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 400]

Subjects were (n=107) 12-year-olds, (n=107) 15-year-olds, and (n=99) elementary student teachers. Results concern the influence of the type of number sentence on performance and the congruence of the generated problems with intuitive models.

***LRNG, M/D, PS, PRSV, REP* (K-12)**

Dossey, John A.; and others. (1994, October). *How school mathematics functions: Perspectives from the NAEP 1990 and 1992 assessments.* Washington, DC: Office of Educational Research and Improvement. [SE 055 437]

This report of the National Assessment of Educational Progress (NAEP) focuses on students' and teachers' reports about the classroom contexts for learning school mathematics in the top-performing one-third of schools compared to the bottom-performing one-third.

***CURR, LSAS, TCHG* (K-12)**

Edwards, Laurie D. (1994, April). *Making sense of a mathematical microworld: A pilot study from a Logo project in Costa Rica.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 055 031]

Sixth-grade students (n=34) worked in pairs investigating a mathematical microworld written in Logo. The investigation had three phases: (1) open exploration, (2) group discussion and sharing of hypotheses, and (3) additional guided discovery and problem solving.

***SOFT, ORAL, PS* (MS)**

Edwards, Thomas G. (1994, April). *Using a model to understand the process of change in a middle school mathematics teacher*. Paper presented at the annual meeting of the National Council of Teachers of Mathematics, Indianapolis, IN. [SE 054 310]

Six factors drive the teacher change process: (1) a perturbation, (2) commitment to change, (3) a vision, (4) projecting self into that vision, (5) deciding to make changes, and (6) being a reflective practitioner. A case study of a middle school teacher is discussed.

***ISRV, MTCG* (MS)**

Fennema, Elizabeth; and others. (1994). *Cognitively Guided Instruction*. Madison, WI: National Center for Research in Mathematical Sciences Education. [SE 054 237]

In CGI (Cognitively Guided Instruction) classrooms, students spend most of their time solving problems. This paper discusses knowledge about children's thinking and what research has shown about CGI, teachers, children, and successful implementation in primary schools.

***ISRV, LRNG* (EC)**

Fitzpatrick, Corine. (1994, April). *Adolescent mathematical problem solving: The role of metacognition, strategies and beliefs*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 921]

Investigated the relationship of various cognitive factors, attributions, and gender to the solution of mathematics problems by (n=100) high school seniors. Cognitive factors included mathematics knowledge, metacognitive regulation and awareness, and beliefs.

***MTCG, PS, BLF, GEND, KNW* (HS)**

Fleener, Jayne. (1994, July). *A research study of teachers' beliefs about calculator use*. Paper presented at the annual meeting of the Association for the Advancement of Computing in Education, San Diego, CA. [SE 055 925]

Survey results suggest teachers (n=231) have differing philosophical orientations related to their stated beliefs about the need for conceptual understanding before using calculators.

***CALC, TATT, TBLF* (EL)**

Ford, Barbara A.; Klicka, Mary Ann. (1994, September). *The effectiveness of computer assisted instruction supplemental to classroom instruction on achievement growth in courses of basic and intermediate algebra*. Newton, PA: Bucks County Community College. [SE 055 590]

Four classes (n=53) of Basic Algebra and five classes (n=50) of Intermediate Algebra were randomly assigned to using or not using CAI supplemental to classroom instruction. Pre- and posttests measured achievement growth for the students.

***ACH, CAI, ALG* (PS)**

Frid, Sandra; Malone, John. (1994, April). *Negotiation of meaning in mathematics classrooms: A study of two year-5 classes*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 396]

A study investigating how students make sense of and utilize mathematics concepts and operations and the social context within which teachers' and students' individual contributions play a role in the sense making.

***LRNG, SOC, TCHG* (MS)**

Goertz, Margaret. (1994, October). *Opportunity to learn: Instructional practices in eighth-grade mathematics: Data from the 1990 NAEP Trial State Assessment*. Brunswick, NJ: Rutgers University. [SE 055 670]

Data from the 1990 NAEP Trial State Assessment (NAEP-TSA) describe educational opportunities for students in eighth-grade mathematics in 1990. Discusses implications of the findings and highlights a follow-up study using data from the 1992 NAEP-TSA.

ACH, LSAS, TCHG, ISRV (MS)

Groves, Susie. (1994, April). *Calculators: A learning environment to promote number sense.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 560]

This report from the Calculators in Primary Mathematics Project describes some critical features of project classrooms which supported the development of number sense with (n=58) 4th-graders in Australia. **CALC, NSNS, TCHG, ARTH, EST (EC)**

Huang, Shwu-Yong L.; Waxman, Hersholt C. (1994a, April). *Differences in Asian- and Anglo-American students' motivation and learning environment in mathematics.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans. LA. [SE 054 750]

This paper compares 1200 (each) Asian- and Anglo-American students on adaptations of three standardized instruments—the Multidimensional Motivational Instrument, the Classroom Environment Scale, and the Instructional Learning Environment Questionnaire.

AFF, CC, SOC, BLF (MS)

Huang, Shwu-Yong L.; Waxman, Hersholt C. (1994b, April). *Investigating middle school students' technology use in mathematics through systematic classroom observation.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 927]

Systematic observations in middle school mathematics classrooms examined whether or not there were gender, ethnic, or grade-level differences in (n=1315) students' use of technology. Only grade-level differences were found. **ETHN, GEND, TECH (MS)**

Ibe, Richard E. (1994, April). *The enduring effects of productivity factors on eighth grade students' mathematics outcomes.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 920]

Estimated the influence of home environment, motivation, ability, classroom environment, quality of instruction, and instructional time on math outcomes using SIMS data. Instructional time was a significant influence upon both achievement and attitude.

ACH, AFF, LSAS, SOC, TCHG (MS)

Irwin, Kathryn; Britt, Murray S. (1994, July). *Mathematical knowledge and the intermediate school teacher.* Paper presented at the annual conference of the Mathematics Education Research Group of Australia, Lismore. [SE 055 240]

Intermediate school teachers (n=8) and secondary school teachers (n=10) were asked to (1) examine their classroom practices, (2) decide what changes they would like to make, (3) make the changes, and (4) reflect on why the changes did or did not improve achievement.

ISRV, TCHG, TKNW (K-12)

Jacobs, Victoria, R.; Lajoie, Susanne. (1994a). *Integrating statistics into the school curriculum.* Madison, WI: National Center for Research in Mathematical Sciences Education. [SE 054 575]

Excerpts from two studies: The first reports the results of introducing (n=10) high-ability middle school students to enrichment activities that promote statistical discussion. The second reports a study of the ways in which group composition influences learning.

CURR, STAT, ACH, GEND, GRPG (MS)

Jacobs, Victoria R.; Lajoie, Susanne P. (1994b, April). *Statistics in middle school: An exploration of students' informal knowledge*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 934]

Ten high-ability middle school students participated in an enrichment program on inferential statistics, emphasizing problem solving in real world contexts. Students were familiar with probability, but struggled with the concept of equally likely outcomes.

***KNW, PROB, STAT, ORAL, PS* (MS)**

Joram, Elana; and others. (1994, April). *Numeracy as cultural practice: An examination of numbers in magazines for children, teenagers, and adults*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 943]

Analysis indicated that difficult mathematical concepts such as fractions, percents, and averages are much more prevalent in adults' magazines than in those of children and teenagers. Implications for preparing students for the numeracy demands of everyday life are discussed.

***FRAC, PCT, SOC, DECM, NSNS* (ALL)**

Kamii, Constance. (1994, April). *Equivalent fractions: An explanation of their difficulty and educational implications*. Paper presented at the National Council of Teachers of Mathematics Research Presession, Indianapolis, IN. [SE 054 434]

This paper reviews some data from previous research documenting the difficulty of equivalent fractions in continuous domains, explains this difficulty in light of Piaget's theory, and suggests ways of improving instruction. ***EQV, FRAC, REVW, IMPL, LRNG* (EL)**

LeBlanc, Mark D. (1994, April). *Using a computer simulation to determine linguistic demands in arithmetic word problem solving, or is the time right for a database of word problems?*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 937]

This paper describes new steps toward a computerized database of addition and subtraction word problems that could provide teachers and students with access to critical natural language terms and expressions for mathematical relationships. ***A/S, LANG, SOFT* (EL)**

Leder, Gilah C.; Forgasz, Helen J. (1994, April). *Single-sex mathematics classes in a co-educational setting: A case study*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 399]

This case study examined the short- and long-term effects on students' attitudes and performance in mathematics of single-sex mathematics classes introduced at the grade 10 level in Australia. Data were collected from students and parents. ***ACH, ATT, GEND, SOC* (HS)**

Martino, Amy M.; Maher, Carolyn A. (1994, April). *Teacher questioning to stimulate justification and generalization in mathematics*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 397]

This paper shows how timely questioning on the part of teachers helped (n=151) 3rd-, 4th-, and 5th-grade students: (1) justify their solutions, (2) connect two isomorphic problems, and (3) understand the strategies of other students. Four episodes are included.

***ORAL, LRNG, PRF* (EL)**

Masingila, Joanna O. (1994, April). *Making mathematics learning in and out of school complementary*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 926]

A framework for studying the interplay between sociocultural and cognitive developmental processes consists of three components: (1) goals, (2) cognitive forms and functions, and (3) interplay among the various cognitive forms. ***LRNG, PS, SOC* (HS)**

Masingila, Joanna O.; and others. (1994). *Mathematics learning and practice in and out of school: A framework for making these experiences complementary*. Syracuse, NY: Syracuse University. [SE 054 456]

Examines mathematics practice in everyday work situations by comparing in-school and out-of-school practice. Presents a framework for gaining insight into the interplay between sociocultural and cognitive developmental processes through analysis of practice.

***LRNG, SOC, TCHG* (K-12)**

Mitchell, Mathew. (1994, April). *Enhancing situational interest in the mathematics classroom.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 940]

Studies of college students (n=15) and high school freshmen (n=68) were conducted using a curriculum called Mathematics of the Environment (MOE) to see if working in groups to resolve environmental problems would increase their interest in mathematics.

***AFF, GRPG, PS* (HS, Ps)**

Mullinix, Bonnie B.; Comings, John. (1994, April). *Exploring what is: An examination of mathematics instruction in adult basic education learning environments*. Paper presented at the National Council of Teachers of Mathematics Research Presession, Indianapolis, IN. [SE 054 524]

Identifies key factors that influence Adult Basic Education (ABE) mathematics instruction in Massachusetts and develops a detailed picture of the adult basic mathematics learning environment. ***D/R, SOC* (Ps)**

Mullis, Ina V. S. (Ed.). (1994, October). *America's mathematics problem: Raising student achievement: A synthesis of findings from NAEP's 1992 mathematics assessment*. Washington, DC: Office of Educational Research and Improvement. [SE 055 438]

Summarizes findings from the 1992 NAEP, including trends in achievement (1990-92), distribution of overall math proficiency, constructed-response questions, national results for demographic subgroups, and trends and trouble spots in math instruction.

***ACH, AFF, LSAS, ETHN, GEND, TCHG* (K-12)**

Mullis, Ina V. S.; and others. (1994, October). *Effective schools in mathematics: Perspectives from the NAEP 1992 assessment*. Washington, DC: Office of Educational Research and Improvement. [SE 055 439]

Data relate to school socioeconomic and demographic characteristics, absenteeism, students changing schools, school problems and climate, college-bound students, impetuses for change, home support, classroom instruction, tracking, and course taking.

***LSAS, SOC, ACH, TCHG* (K-12)**

National Center for Education Statistics. (1994, January). *Changes in math proficiency between 8th and 10th grades*. Washington, DC: Office of Educational Research and Improvement. [SE 054 210]

Data on (n=16,659) students show: (1) Students taking higher level math courses are more proficient at higher levels of math; (2) Students behind by 8th grade continue to fall behind; and (3) Students planning to go to college have higher math proficiency in 8th grade.

***ACH* (SE)**

Neil, Marilyn S. (1994, March). *Parent-teacher partnerships: Enhancing learning in mathematics.* Paper presented at the Association for Childhood Education International Study Conference, New Orleans, LA. [SE 055 421]

This paper reviews research discussing what teachers and school administrators can do to establish parent-teacher partnerships in mathematics. **REVW, SOC (K-12)**

Philipp, Randolph; and others. (1994). *Reflective practitioners reform school mathematics.* Madison, WI: National Center for Research in Mathematical Sciences Education. [SE 054 238]

Participating middle school teachers focused on problem solving, conceptual relationships and understanding, and communication in mathematics; had a comprehensive knowledge of the math they were teaching; and participated in their own professional growth.

MTCG, TCHG, TCHR, ISRV (MS)

Poirier, Louise. (1994, April). *Conceptual and developmental analysis of mental models: An example with complex change problems.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 931]

Three implicit mental models used by children (n=198) in complex change problems were identified: sequential, state comparison, and change comparison. Identified two conceptual leaps: (1) representation of the problem structure and (2) concept of number.

LRNG, NSNS, REP, ARTH (EL)

Randhawa, Bikkar S.; and others. (1994, April). *Context and ability effects on children's development of mental addition.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 055 253]

To test the theory of mental calibration for addition it was hypothesized that the mean reaction time would be faster for problems in homogeneous versus heterogeneous sets and that reaction time was inversely related to ability and grade level and independent of gender.

A/S, ACH, GEND (EL)

Robinson, Scott. (1994, April). *Mathematics and science learning milieus in diverse schools in Florida: African-American students from small town, low socio-economic backgrounds.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 925]

Observations of an eighth-grade physical science class, a sixth-grade mathematics class, and an eighth-grade science assembly, as well as interviews with the teachers of these classes, show that traditional methods of teaching prevailed in these classrooms.

ETHN, SOC, TCHG (MS)

Ross, John A. (1994, April). *Effect of feedback on student behavior in cooperative learning groups: A case study of a grade 7 math class.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 936]

Seventh-grade math students (n=18) were audiotaped in cooperative learning groups, were given edited transcripts of their discussions, and were trained in their interpretation. The self-assessment enhanced help seeking and giving and attitudes toward asking for help.

ASSM, ATT, GRPG, ORAL (MS)

Sawada, Daiyo. (1994, April). *Mathematics as problem solving—A Japanese way.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 924]

Describes problem solving in a Japanese 5th-grade classroom in terms of embedding the problem, spending a long time on one problem, acting out the problem, multiple solutions, interesting problems, manipulative aids, and interpretation rather than application.

***PS, TCHG* (MS)**

Schunk, Dale H. (1994, April). *Goal and self-evaluative influences during children's mathematical skill acquisition*. West Lafayette, IN: Purdue University, 1446 LAEB, Room 5108. [SE 054 251]

This paper describes an experiment that investigated the effects of performance goals and self-evaluation on self-regulation processes and achievement outcomes of (n=44) fourth-grade students working with fractions. Implications are discussed. ***ACH, MTCG, FRAC* (EC)**

Simon, Martin A. (1994, April). *Beyond inductive and deductive reasoning: The search for a sense of knowing*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 557]

The characterization of mathematical justifications as inductive or deductive is incomplete. There is a third type of reasoning, transformational reasoning. Topics discussed include contrasting the presence and absence of transformational reasoning and implications for teaching.

***LRNG, PS, PRF* (K-12)**

Smith, Tommy; Easterday, Kenneth E. (1994). *Field dependence-independence and holistic instruction in mathematics*. Auburn, AL: Auburn University. [SE 055 574]

Four groups of (n=201) undergraduate students—math majors, secondary math education majors, other secondary education majors, and other majors—differed on a measure of field independence. Implications with regard to holistic teaching and curricula are discussed.

***STYL, TCHG, CURR, LRNG* (PS)**

Stacey, Kaye. (1994, April). *Calculators in Primary Mathematics: An analysis of classroom activities*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 559]

This report from the Calculators in Primary Mathematics Project describes the types of uses of the calculator that have become an established part of new teaching practices based on a sample of (n=11) teachers in Australia. ***CALC, TCHG, TBLF* (EC)**

Stacey, Kaye; Groves, Susie. (1994, April). *Calculators in primary mathematics*. Paper presented at the annual meeting of the National Council of Teachers of Mathematics, Indianapolis, IN. [SE 054 523]

Describes a long-term investigation into the effects of calculators on the learning and teaching of primary mathematics, with particular emphasis on ways teachers use calculators and the resulting long-term learning outcomes for students. ***CALC, LRNG, TCHG* (EC)**

Steinberg, Ruth M.; and others. (1994, April). *Toward instructional reform in the math classroom: A teacher's process of change*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 055 256]

The fourth-grade teacher in this study used Cognitively Guided Instruction and underwent change in: (1) teaching and thinking; (2) stimulating the process of change; (3) learning from and helping individuals; and (4) building on children's thinking in instruction.

***ISRV, LRNG, TCHG* (EC)**

Walen, Sharon B. (1994a, April). *Identification of student-question teacher-question student-response pattern: Students' interpretation of empowerment*. Bozeman, MT: Montana State University. [SE 054 378]

Students (n=65) from two algebra classes, whose teacher was changing her teaching methods, were observed. Discussion considers teacher's answers as an influence on student questions and typical and exceptional dialogue patterns. ***ORAL, TCHG, ALG*** **(SE)**

Walen, Sharon B. (1994b, April). *Students' prejudices and algebra reform: Value, ability, and self.* Bozeman, MT: Montana State University. [SE 054 372]

Includes a summary of the views of (n=52) students from two algebra classes, whose teacher was changing her methods, prior to analysis, and then analyzes factors that influence students' classroom perceptions. ***AFF, BLF, TCHG, ALG*** **(SE)**

Wilson, Melvin R. (1994, April). *Implications for teaching of one middle school mathematics teacher's understanding of fractions.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 055 260]

A middle school teacher's view of mathematics was that of a correct set of rules and concepts, which contributed to his insistence on maintaining a teacher-dominated classroom environment despite innovative curriculum materials. ***TBLF, TCHG, FRAC, MATL*** **(MS)**

Zambo, Ron. (1994, October). *Beliefs and practices in mathematics problem solving instruction: K-8.* Paper presented at the annual meeting of the School Science and Mathematics Association, Fresno, CA. [SE 055 282]

Results of a survey of (n=744) teachers, grades K-8, to answer the following questions: (1) What is the nature of problem-solving instruction in Arizona classrooms, and (2) To what extent does classroom practice reflect the recommendations of the NCTM?
PS, TCHG, TBLF **(EL)**

Zambo, Ron; Hess, Robert. (1994, October). *The gender differential effects of a procedural plan for solving mathematical word problems.* Paper presented at the annual meeting of the School Science and Mathematics Association, Fresno, CA. [SE 055 281]

This paper reports an investigation of potential gender-related effects on sixth graders of an explicitly stated problem-solving plan. ***GEND, PS*** **(MS)**

Zambo, Ron; Hong, Eunsook. (1994, April). *Elementary school teachers' instructional behavior in mathematics problem solving: A comparative study.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. [SE 054 505]

Questionnaires to determine teachers' use, perceptions of the usefulness, confidence in using, and beliefs concerning recommendations for problem-solving instruction were given to (n=164) Korean and (n=195) American teachers, grades 1-6. ***PS, TBLF, TCHG, CC*** **(EL)**

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Hsu	MTOG, SOFT
Hu	CC, CURR
Isbell	CAI, CURR
Jiang	PROB, SOFT
Johnson, J. M.	ASSM, SOFT
Keim	CURR
Keller	ALG, SOFT
Kim, S. Y.	MANP, SOFT
Klein	ADVM, SOFT
Kwak	CII, CURR
Lee, R. E.	CURR, PS
Luce	MATL, SOC
Maxwell	CURR, PRSV
McGlamery	CURR, ISRV
McKeman	MATL
McMann	ACH, CURR
Mittag	CURR, STAT
Newsome	NSNS, SOFT
O'Neal	CURR
Olson	ALG, IC
Oropesa	CURR, DSCM
Pihero	CURR, SOFT
Rasimas	CURR, D/R
Rickard	CURR, PS
Roberts	ACH, MATL
Sletteebaar	CAI, SOFT
Smyser	GEOM, SOFT
Stecker	ASSM, CURR, LD
Strange	CURR, MEAS
Suggate	PLCV, REP, SOFT
Sun	CC, CURR
Thompson	CALS, DSCM, MATL
Vohra	CURR, TECH
Wdensky	CURR, TECH

Articles

Berlin	IC, ISRV, LRNG
Chandler (a)	CURR, MATL
Chandler (b)	CURR, MATL
Clements, D. H.	GEOM, REVW, SOFT
Cope	GEOM, PS, SOFT
Dorgan	CURR, FRAC, IMPL
Dugdale	REP, SOFT
Flanders	CURR, LSAS
Gravemeijer	CURR, RSCH
Hatfield	MANP, TCHG
Jiang	PROB, SOFT
Johnson-Gentile	GEOM, MANP, SOFT
Lehman (a)	IC, TBLF
Ponte	CURR, TCHG
Schiddell	CURR, GEOM, LSAS
Schoenfeld (a)	CURR, REVW
Steffe; Wiegel	LRNG, SOFT
Thompson; Lambdin	IMPL, MANP
Woodward	D/R, LD, SOFT
Wright (a)	CURR, REVW, TCHG
Yusuf	GEOM, LRNG, SOFT

Papers

Brodsky	ACH, ATT, MATL
Dossey	CURR, LSAS, TCHG
Edwards, L. D.	SOFT
Jacobs (a)	CURR, STAT
LeBlanc	A/S, LANG, SOFT

Diagnosis, remediation (D/R); Developmental, remedial mathematics (DEVM)

Dissertations

Arriola	D/R
Baker	D/R
Barker	DEVM, TCHG
Bartlett	DEVM, TCHG
Bershinsky	ACH, DEVM
Burns	D/R, SOFT
Cox	ACH, D/R
Drevno	D/R, LD
Foutz	DEVM, TCHG
Gibbs	DEVM, ETHN
Henry, M. J.	DEVM, LD, SOFT
Hight	DEVM, TCHG
Johnson, L. F.	ALG, DEVM
King	ASSM, DEVM
Lee, M. J.	D/R
Madden	ASSM, D/R
Mau	DEVM, TCHG
O'Connell	D/R, PROB
Pierson	DEVM
Rasimas	CURR, D/R
Skinner	DEVM, TCHG

Articles

Bart	ASSM, D/R
Borasi	D/R, TCHG
Cumming	A/S, D/R
Jaspers	D/R, LD
Newman	ACH, DEVM
Woodward	D/R, LD, SOFT

Papers

Mullinix	D/R, SOC

Ethnic, racial, cultural factors (ETHN); Gender differences (GEND); Social factors, parents, context (SOC); Cross-cultural (CC)

Dissertations

Caftori	GEND, SOFT
Carter, J. P. W.	ETHN, SOC
Caselman	AFF, SOC
Chakalisa	ACH, GEND, TCHR
Dresden	GEND, PERS
Gabriele	GRPG, SOC
Gibbs	DEVM, ETHN
Glover	ETHN, SOC
Hu	CC, CURR
Kincheloe	ACH, SOC
Lato	SOC, TCHG
Luce	MATL, SOC
Mallon	AFF, GEND, SOC
Paredes	CC
Reeves	GEND
Smith, E. E.	LRNG, SOC
Sun	CC, CURR
Taylor	PS, SOC
Thomas	AFF, ETHN, TCHG
Trowell	PS, SOC

Articles

Bishop	ETHN, IMPL, RSCH
Borget	AFF, GEND
Callahan	ETHN, IMPL
Carroll, J.	AFF, LRNG, SOC
D'Ambrosio	CC, RSCH, SOC
Fennema	GEND, RSCH
Fortuny	ASSM, SOC
Gallagher	GEND, LSAS, PS
Ganter	CALS, ETHN, TCHG
Gerdes	ETHN, RSCH, SOC
Goos	MTOD, PS, SOC
Hood	GEND, REP
Inkpen	GEND, TECH
Kloosterman	ACH, AFF, SOC
Lo; Wheatley	ORAL, SOC
McCoy	GEND, PS
Moore, C. G	ETHN, REVW
O'Melia	GRPG, LD, SOC
Pajares	AFF, GEND, PS
Randhawa (a)	GEND, PS
Randhawa (b)	ACH, AFF, CC
Sammy	ACH, CC, LRNG
Sayers	ACH, GEND
Shroyer	GEND
Silver	CC, RSCH
Skaalvik	ACH, AFF, GEND
Van Voorhis	AFF, SOC, TCHR
Van Zoest	PRSV, SOC, TBLF
Voigt	ARTH, LRNG, SOC
Webb	ETHN, GRPG
Zambo	GEND, PS

Papers

Davenport	GEND, IMPL, REVW
Frid	LRNG, SOC, TCHG
Huang (a)	AFF, CC, SOC
Huang (b)	ETHN, GEND, TECH
Joram	FRAC, PCT, SOC
Leder	ACH, ATT, GEND
Masingila, J. O.	LRNG, PS, SOC
Masingila; al.	LRNG, SOC, TCHG
Mullinix	D/R, SOC
Mullis; al.	LSAS, SOC
Neil	REVW, SOC
Randhawa	A/S, ACH, GEND
Robinson	ETHN, SOC, TCHG
Zambo; Hess	GEND, PS

Geometry (GEOM); Measurement (MEAS); Spatial visualization (VIS)

Dissertations

Higginbotham	CAI, MANP, VIS
Lee, S. W.	GEOM, VIS
Massey	GEOM, LANG, LRNG
Mikusa	GEOM, PRF
Smyser	GEOM, SOFT
Strange	CURR, MEAS
Wu	GEOM, TCHG

Articles

Antonietti	PS, VIS
Battista (a)	GEOM, REP, VIS
Boulter	GEOM, PS, STYL
Clements, D. H.	GEOM, REVW, SOFT
Cope	GEOM, PS, SOFT
De Block-Docq	GEOM, LRNG, PS
Gholam	LSAS, LRNG, MEAS
Johnson-Gentile	GEOM, MANP, SOFT
Lawson	ACH, GEOM, PS
Lovett	GEOM, PS, REP
Paas	CAI, GEOM, PS
Schiddell	CURR, GEOM, LSAS
Simon; Blume (a)	FRAC, MEAS
Simon; Blume (b)	M/D, MEAS
Yusuf	GEOM, LRNG, SOFT
Zech	GEOM, PS, TECH

Language, psycholinguistics (LANG); Representations, modelling (REP)

Dissertations

Artuso	PLCV, REP
Awtry	ALG, REP
Bearden	ACH, LANG
Bennett, E. M.	CALS, REP, SOFT
Bloome	AFF, LANG
Bowman	PERV, REP
Cerreto	ALG, PS, REP
Covell	DEAF, LANG
Fan, N.	LANG, PS
Gurney	REP
Halpern	LANG
Hariki	LANG, WRIT
Hsieh	REP, SOFT
Klig	PS, REP
LeBlanc	LANG, REP
Massey	GEOM, LANG, LRNG
Mukunda	LANG, PS
Perlwitz	LANG, PLCV
Poppe	ALG, REP
Smith, M. A.	LANG, PERS
Sosa	LANG, PS
Suggate	PLCV, REP, SOFT
Tunstall	REP
Whang	LANG, PS

Articles

Battista (a)	GEOM, REP, VIS
Berg; Phillips	LRNG, REP
Berg; Smith	ASSM, REP
Bernardo	LANG, PS, REP
Boulton-Lewis	A/S, REP
Callejo	PS, REP
Carroll, W. M.	ALG, REP
Dugdale	REP, SOFT
Esty	LANG, PS
Fan	A/S, LANG
Hood	GEND, REP
Lawler	PS, REP
Lovett	GEOM, PS, REP
Miller	ALG, LANG
Nemirovsky	LRNG, REP
Nunokawa	LRNG, PS, REP
Pirie	LRNG, REP
Reed	ALG, PS, REP
Shama	COMP, PS, REP
Speiser	CALS, REP
Thompson; Thompson	FRAC, LANG
Verschaffel	A/S, LANG
Watson	PS, REP

Papers

Adams	ALG, GCAL, REP
Chiu	INT, LANG, PS
LeBlanc	A/S, LANG, SOFT
Poirier	LRNG, NSNS, REP

Learner characteristics (LRNR); Learning style, cognitive style (STYL); Personality (PERS); Student knowledge (KNW); Gifted (GIFT); Learning disabled (LD); Hearing impaired (DEAF)

Dissertations

Behrend	LD, PS
Chen	LD, TCHG
Chien	DEAF, LRNG
Cichos	GIFT, LD
Covell	DEAF, LANG
Dobbins	CAI, LD
Dresden	GEND, PERS
Drevno	D/R, LD
Faurot	AFF, BLF, KNW
Follett	SOFT, STYL
Gerhard	STYL
Gillespie	ACH, PERS
Hall	ACH, STYL
Harrison	LD
Henry, M. J.	DEVM, LD, SOFT
Hoosain	KNW, PS, TBLF
Johnson, W. R.	ACH, LRNR, TCHR
Moore, S. D.	GIFT, PS
Rottier	AFF, KNW
Sanders	STYL, TCHG
Simpson	DEAF, TCHG
Smith, M. A.	LANG, PERS
Stecker	ASSM, CURR, LD
Tournaki	LD, TCHG

Articles

Boulter	GEOM, PS, STYL
Jaspers	D/R, LD
Kaur	ALG, ARTH, KNW
Mills	ACH, GIFT
O'Melia	GRPG, LD, SOC
Parmar	ACH, LD
Shaughnessy	CALS, PERS
Skovsmose	KNW, MTCG
Williams	LD, M/D
Woods	ACH, AFF, LD
Woodward	D/R, LD, SOFT

Papers

Jacobs (b)	KNW, PROB, STAT
Smith	STYL, TCHG

Learning, learning theories, cognitive development (LRNG); Metacognition, reflection (MTCG)

Dissertations

Blagmon-Earl	EQV, LRNG
Chien	DEAF, LRNG
Clark, F. B.	LRNG, M/D
Costa	LRNG, PCT
Dallaway	LRNG, M/D
Gooya	MTCG, TCHG
Gutstein	LRNG, SOFT
Hsu	MTCG, SOFT
Kim, Y. S.	ARTH, ASSM, LRNG
Langrall	ISRV, LRNG
Massey	GEOM, LANG, LRNG
Ottinger	LRNG, TCHG
Smith, E. E.	LRNG, SOC
Sneller	LRNG, STAT
Vidakovic	GRPG, LRNG

Articles

Berg, Phillips	LRNG, REP
Berlin	IC, ISRV, LRNG
Cai	MTCG, PS
Carroll, J.	AFF, LRNG, SOC
Clements, M. A.	FRAC, LRNG
De Block-Docq	GEOM, LRNG, PS
Dubinsky	ADVM, LRNG
Gholam	LSAS, LRNG, MEAS
Goos	MTCG, PS, SOC
Gray	ARTH, LRNG
Herscovics	ALG, ARTH, LRNG
Kieran	LRNG, REVW
Lembke	LRNG, PCT
Lo; al.	BLF, LRNG, ORAL
Lubinski; al.	MTCG, PLAN
Marine	MTCG, STAT
Nemirovsky	LRNG, REP
Nesher	LRNG, PS
Nunokawa	LRNG, PS, REP
Perrenet	ALG, MTCG
Perry	A/S, LRNG
Pine	LRNG, REP
Saenz-Ludlow	FRAC, LRNG

Learning, learning theories, cognitive development (LRNG); **Metacognition**, reflection (MTCG) *(cont.)*

Probability (PROB); **Statistics** (STAT); **Discrete mathematics** (DscM)

Problem solving, reasoning (PS); **Proof**, justification (PRF); **Metacognition**, reflection (MTCG)

Preservice teacher education (PSRV); Inservice teacher education, professional development (ISRV)

Teacher characteristics (TCHR); Teacher anxiety (TANX); Teacher attitudes (TATT); Teacher beliefs (TBLF); Teacher content knowledge, pedagogical knowledge (TKNW)

Teaching role, style, methods (TCHG); Grouping for instruction, cooperative learning (GRPG); Planning, decision making (PLAN); Oral communication, classroom discourse (ORAL); Writing, journals (WRIT)

Teaching role, style, methods (TCHG); **Grouping for instruction**, cooperative learning (GRPG); **Planning**, decision making (PLAN); **Oral communication**, classroom discourse (ORAL); **Writing**, journals (WRIT) *(cont.)*

Technology (TECH); **Calculators** (CALC); **Graphing calculators** (GCAL); **Computers** (COMP); **Software**, programming (SOFT); **Computer-assisted instruction** (CAI); **Computer-integrated instruction** (CII)

Technology (TECH); Calculators (CALC); Graphing calculators (GCAL); Computers (COMP); Software, programming (SOFT); Computer-assisted instruction (CAI); Computer-integrated instruction (CII) *(cont.)*

Papers

NOTES

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